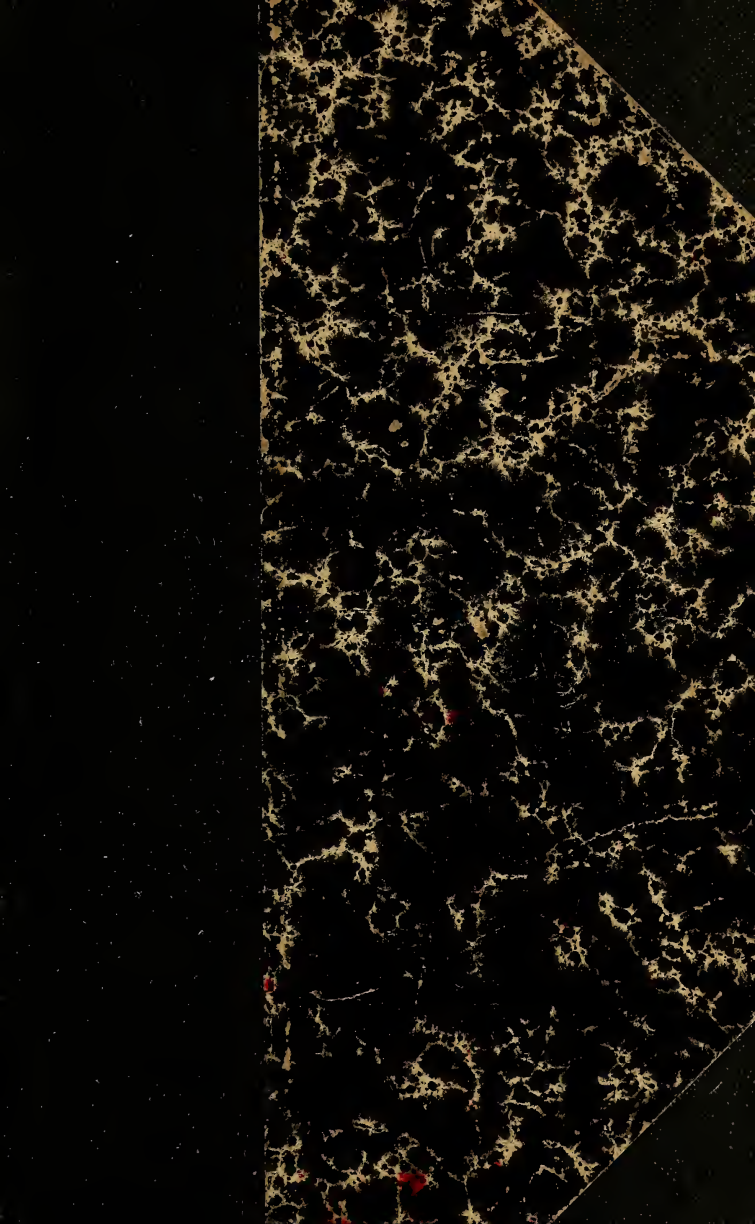


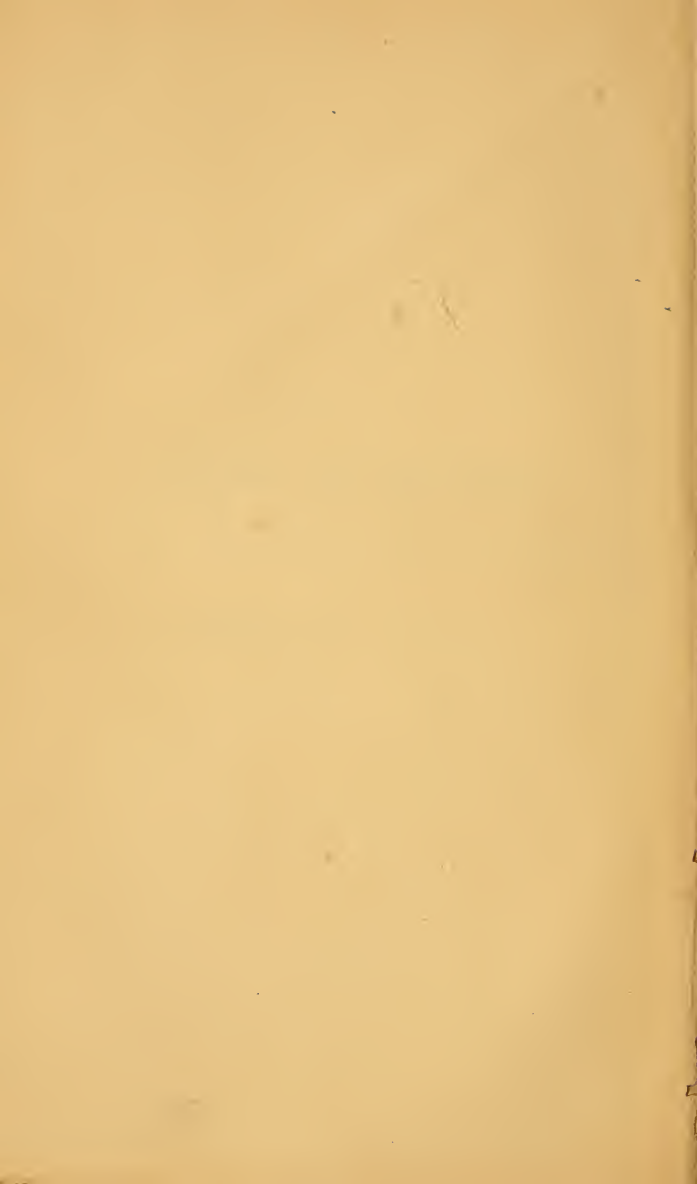


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DEFECTS OF SIGHT,
THEIR NATURE, CAUSES, PREVENTION,
AND
GENERAL MANAGEMENT.



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DEFECTS OF SIGHT,

THEIR NATURE, CAUSES, PREVENTION,

AND

GENERAL MANAGEMENT.

BY

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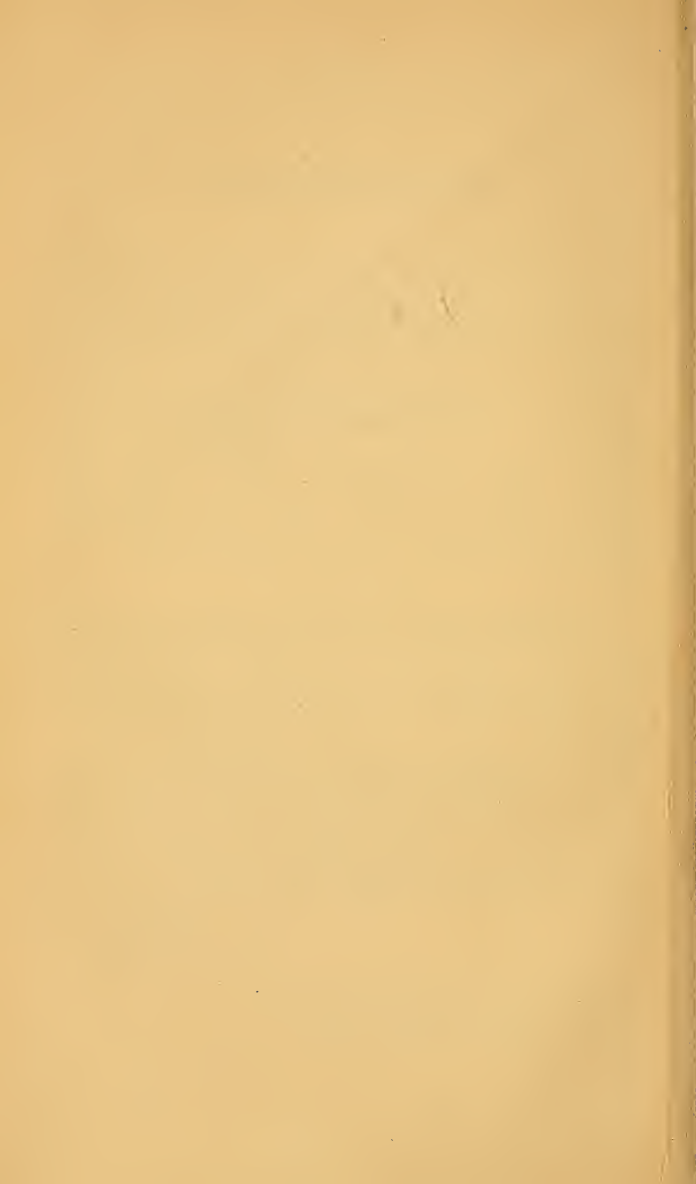
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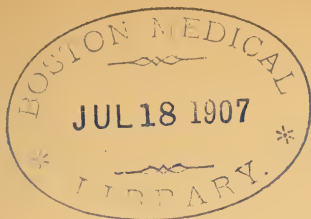
MUCH of the mortality which figures in the Registrar-General's Reports, it has been shown, might be prevented by attention to sanitary measures. In like manner, much of the defective sight and blindness which we meet with is the result of disease, either preventible altogether, or at least curable if taken in time.

Impressed with this fact, it has occurred to me that a small volume containing some guiding principles relative to the care and preservation of the sight would be useful. Accordingly, I have thrown together, in the following pages, such observations on the subject as appear to me calculated to answer the end in view.

THE AUTHOR.

35, GEORGE STREET, HANOVER SQUARE,
LONDON; *August* 1, 1856.





DEFECTS OF SIGHT:

THEIR NATURE, CAUSES, PREVENTION, AND
GENERAL MANAGEMENT.

PART I.

CHAPTER I.

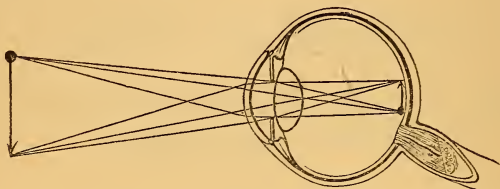
STRUCTURE OF THE EYES AND NATURE OF THE SENSE OF SIGHT.

THE optic nerves or special nerves of sight—two in number—are each at one end connected with the brain and at the other expanded into a nervous membrane, named *retina*, which lines the interior of the back part of the eyeball.

Like telegraphic wires, the optic nerves constitute the media of transmission between the retina, on which the impressions of sight are made, and the brain, where the sensations of sight are perceived.

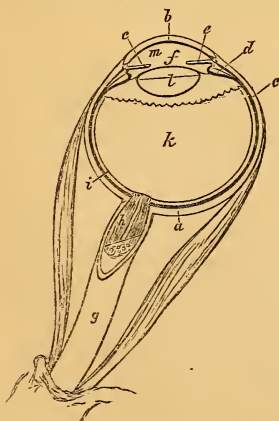
The segment of the eyeball in front of the retina is a dioptric apparatus or system of lenses, by which the rays of light entering the eye from external objects are so refracted or bent that they are made to

converge and come to foci or points on the retina. Images of the objects from which the light comes are thus projected on that membrane as on the table of a camera obscura, thus :—



The impression so made on the retina being transmitted by the optic nerve to the brain, a visual sensation of the object is excited in the mind, or, in common language, *we see it*.

Structure of the Eyeball.

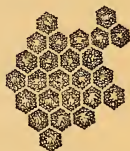


Horizontal section of the right human eyeball, natural size.

Optically considered, the eyeball is, in its construction, a true camera obscura.

The wall of the ocular chamber is composed externally of the *sclerotic coat* (*a*), except anteriorly, where it is formed by the transparent *cornea* (*b*), which, like a window, closes in the front of the eyeball. The sclerotic coat is lined inside by one more delicate, named the *cho-*

roid coat (c), which contains much dark pigment dispersed throughout its substance. Towards the place where the sclerotic joins the cornea, the choroid coat presents a peculiar plicated structure called *ciliary body (d)*. On the inner surface of the choroid coat again, there is a mosaic pavement-like work of flat six-sided cells of microscopical minuteness, filled with dark brown particles, forming the *proper pigment membrane*, by which the interior of the ocular camera is darkened for a purpose corresponding to that for which opticians obscure the interior of their instruments by painting it black, viz., in order that any extraneous rays of light may be absorbed and prevented from interfering with the distinctness of the image formed on the table of the camera.



Had the interior of our eyes been undarkened, not only would our sight have been indistinct, but we should have suffered from a painful dazzling in the exercise of vision in bright light, as is the case with Albinos, in whom the pigment of the eyes, as well as that of the skin, is deficient.

Situated behind the transparent cornea, and supported on both surfaces by the aqueous humour, is seen the *iris (e e)*, a flat circular membrane, perforated by a round aperture, called the *pupil (f)*. The anterior surface of the iris, as seen through the transparent cornea in the living eye, is differently coloured in different individuals — blue, hazel, &c.: indeed, it is the colour of the anterior surface of the iris which, in common language, is spoken of as the

colour of the eye generally; thus, a blue eye or hazel eye, means merely an eye with a blue iris or one with a hazel-coloured iris. The posterior surface of the iris is invested with a dark pigment-membrane, which is a modified continuation of that lining the inner surface of the choroid coat.

The iris perforated by the pupil, thus situated behind the transparent cornea, is, in the camera of the eye, what the shutter with the hole in it is in the primitive form of the camera obscura, or what a stop or diaphragm is in more perfect instruments. But more than this, it is a stop or diaphragm, the aperture of which is variable in size, and self-adjusting: by means of the contractile power with which the iris is endowed, the pupil admits of being varied in size; but not alone this,—there is a provision by which the contractile power of the iris is called into operation without any effort on our part, under the very circumstances which require the variation in the size of the pupil, viz., in bright light, contraction—in dull light, dilatation of that aperture.

The *retina* (*i*), or expansion of the optic nerve, it has been above mentioned, lines the interior of the back part of the eyeball, being situated within the pigment membrane, and is the table on which, in our ocular camera obscura, the image of external objects is projected by the dioptric apparatus placed immediately in front of it.

The dioptric apparatus of the eye consists of the *vitreous humour*; the *crystalline lens*, the *aqueous humour*, and the *cornea*.

The *vitreous humour* (*k*) is a transparent jelly-like

mass, which fills up the posterior and middle part of the interior of the eyeball. It is concavo-convex in shape. Its convexity, which is behind, is in close apposition with the concave surface of the retina; in its concavity, which is directed forward, the crystalline lens lies imbedded.

The *crystalline lens* (*l*) is double convex, but unequally so. The more convex surface is the posterior, and is sunk in the concavity which the vitreous humour presents anteriorly.

In front of the crystalline lens is the *aqueous humour* (*m*), which owes its shape to that of the cavity wherein it is contained. The cavity in question is convex anteriorly, and concave posteriorly, being bounded in the former direction by the posterior and concave surface of the cornea; and in the latter direction by the anterior convex surface of the crystalline lens. Furthermore, this cavity containing the aqueous humour is subdivided by the iris into two compartments, communicating through the pupil, called the *anterior and posterior chambers of the aqueous humour*.

Lastly, the transparent watch-glass-shaped *cornea*, at the same time that it closes in the front of the eyeball, forms an important part of the dioptric apparatus.

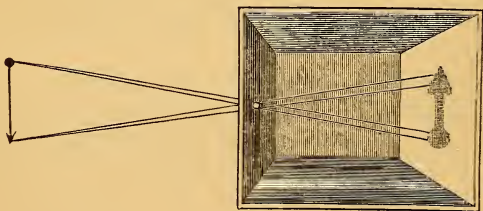
Of the Projection of Images on the Retina.

In order that the mechanism by which images are projected on the retina may be more readily understood, it will be useful to premise a brief explanation

of the projection of images on the table of the *camera obscura*.

It is a law of light, that its rays, as long as they continue in the same medium, proceed in straight lines. Of the rays of light which diverge in straight lines in all directions from the different points of any external object, some will enter a hole in the shutter of a window looking towards the object, while others will be stopped by the shutter. The rays which enter the hole continue their straight course within the chamber, the window of which is closed by the shutter, until they are stopped by the opposite wall, or by a sheet of white paper held up opposite the hole in the shutter. On the wall, or on the sheet of paper on which the rays of light are received, there is seen a picture of the external object whence the rays of light, which entered the hole of the shutter, came.

In regard to this picture, it is to be observed that it is inverted and ill-defined, thus :

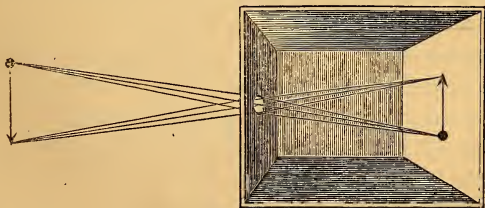


The cause of the inversion of the picture, it will be seen from the diagram, is that the rays of light from the upper part of the object which enter the hole, continuing their rectilineal progression within the

chamber, necessarily impinge on the lower part of the wall or paper, while the rays from the lower part of the object as necessarily impinge on the upper part of the wall or paper; and so on with the rays from the sides and intermediate points of the object.

The cause of the imperfect definition of the picture, again, is, that the rays of light which form it do not impinge on the wall or paper in points or foci corresponding to those of the object whence they issued, but in a state of divergence, as may be seen in the diagram.

If a convex lens be inserted in the hole of the shutter, the image is no longer indistinct, but well-defined when the sheet of paper on which it is projected is held at a certain distance behind the lens. The explanation of this is, that the rays of light diverging from all the different points of the object are so refracted or bent from their original direction in passing through the convex lens, that they are rendered convergent, and so meet again in foci or points, as they fall on the sheet of paper, corresponding to those points of the external object whence they originally diverged, thus:



It will be seen from the diagram, that though dis-

tinct from accurate definition, the picture is still inverted, for the same reason that the picture, formed without a lens in the hole of the shutter, is inverted.

To come to the projection of images on the retina:

That a well-defined picture is projected on the retina, as shown in the diagram (p. 2), may be actually demonstrated by taking the eye of an animal newly slaughtered, such as an ox or a sheep, and cutting away a piece of the sclerotic and choroid coats at its back part, when by directing the cornea towards any object, a lighted candle for instance, we shall see a small inverted picture of the object shining through on the exposed retina like the image on the screen of the phantasmagoria. A similar demonstration may be given on a white rabbit's eye, without other preparation than dissecting clean the posterior surface of the sclerotica.

Like the lens of the camera obscura, the ocular dioptric apparatus so refracts or bends the rays of light, which enter the eye in a state of divergence from the several points of an external object, that they are made to converge to points or foci. These points or foci of light impinge on the retina, as on the table of a camera obscura, in the same relative order as that in which the rays forming them originally diverged from the several points of the external object.

As to the particular action of the dioptric parts of the eye on the rays of light in their course to the retina: of the pencils of rays diverging from the various points of external objects, those only which fall on the cornea, and are transmitted by it to the aqueous humour, and thence through the pupil to the

retina, are concerned in vision. Those rays which fall on and pass through the circumferential part of the cornea, are stopped by the iris, and are either reflected or absorbed by it. The effect of the refraction by the cornea, and of that by the different humours on the rays, is to make them converge; hence, each pencil represents two cones, with their bases touching each other at the anterior surface of the cornea, fig. 1, p. 2.

Of all the dioptric parts of the eye, the cornea is that which contributes most to the convergence of the rays of light. This is because the rays enter it from the air, which is of so much less refractive density than the cornea. The crystalline lens, though double convex, and of greater refractive density than the cornea, contributes comparatively little to the convergence of the rays of light, because the latter enter the crystalline lens from the aqueous humour, the refractive density of which is not so much exceeded by that of the crystalline as the refractive density of the air is by that of the cornea. The aqueous humour being somewhat less dense than the cornea, and presenting a convex surface to the incident rays, the convergence which the light acquired in passing through the cornea is slightly diminished on entering it. The vitreous humour, on the contrary, continues, and slightly augments the convergence of the rays which enter it from the crystalline lens, as it is of less density than that body, and presents a concave surface to the incident rays.

The curvatures of the refractive media of the eye

are not spherical, but such as are calculated to bring all the rays of light to one focus, so that there is no spherical aberration. In like manner, the concave surface of the retina is not spherical, but of such a curvature as to be in its principal parts at a due focal distance behind the cornea and lens, one of the conditions for the prevention of distantial aberration.*

Vital Action of the Optic Nervous Apparatus.

The act of seeing consists in the mind's perceiving the sensations of light and colour excited by the impressions on the retina made, in the manner now explained, by external objects through the medium of the external agent, light. The sensations of light and colour, and the ideas which the mind reads off therefrom respecting the form, &c., of external objects, depends wholly on the living actions and endowments of the optic nervous apparatus, and the co-operation of the mind through its organ, the brain. When the optic nervous apparatus is paralysed, it is no longer susceptible to the impression of light; hence, though the dioptric apparatus of the eye perfectly performs its function, there is blindness—the camera

* See, for further details regarding the curvatures of the eye, my 'Anatomical Introduction, explanatory of a horizontal section of the human Eyeball,' in Mackenzie's 'Practical Treatise on Diseases of the Eye,' 4th ed., London, Longman and Co., 1854. And for details regarding the correction of the optical aberrations in the eye, see my 'Essay on the Wisdom and Beneficence of the Almighty as displayed in the Sense of Vision,' London, Churchill, 1851.

obscura in vain throws the picture on the insensible retina.

In the exercise of vision, we refer our perceptions to without and to some distance from the eye, taking no cognizance of the fact that the impression exciting the sensation is actually made on the retina, nor of the intervention of the impressing agent, light.

Whether the perception of externality or outness depend on an original connate law of the economy, or on experience and association acquired through the touch? has been a question with philosophers.

Among other arguments in support of the opinion that we do not originally perceive objects to be *out* from the body, but that the mind originally refers the visual sensation to the eye, as it does a tactile sensation to the point of the finger; and that it is only by experience, through touch, that we learn to perceive the outness of visible objects, the statements of persons born blind from cataract, who have acquired sight by an operation, have been adduced. Some of these persons have alleged that when they first acquired sight, they thought all things touched the eyes. But this, it could easily be shown, is merely loose figurative language. Even if the fact were as stated, it would, if strictly examined, prove no support to the opinion, because it was merely the surface of the eye which was alleged to be the seat of the sensation, whereas it ought to have been the retina, and the person ought, therefore, to have supposed that objects not only touched, but were actually in the eye.

Much more trustworthy evidence of what is the

fact is supplied us by infants and the young of the lower animals. An infant grasps at external objects. A chick, on emerging from the shell, will run and pick up a grain; an act the animal would not likely perform if it referred the grain to the interior of its own eye, instead of to without, and to some distance from its body.

I have no hesitation in expressing my belief that our faculty of perceiving outness is truly dependent on an original connate law of our minds. In support of this, I would borrow an illustration from the sense of touch itself—the very sense which is relied on in favour of the opposite side of the question. The illustration I would adduce, is the well-known fact, that persons who have had the misfortune to lose a limb, sometimes feel as if the lost organ were still in connection with the body, and that some part of it, perhaps, is the seat of pain. Thus, to quote from the ‘Spectator’: “The poor fellow who lost his arm last siege, will tell you, he feels the fingers that were buried in Flanders ake every cold morning at Chelsea.”*

Mechanism of the Movements of the Eyeballs.

Of a globular form, each eyeball lies safely lodged in its socket, where it is so balanced in the orbital capsule, as to admit of being turned in all directions,

* For further details on this subject, and its bearing on the explanation of erect vision, though retinal impressions are inverted, of the apparent size of objects, and of single vision with two eyes: See my Essay on ‘The Wisdom and Beneficence of the Almighty as displayed in the Sense of Vision,’ above referred to.

within certain limits, by the action of its six muscles. These muscles acting singly, make it revolve in so many different primary directions—inwards, outwards, upwards, downwards, obliquely downwards, obliquely upwards—on three imaginary axes; but acting in various combinations, they make it revolve, on other axes, in various other directions.

The two eyeballs move in concert, and in order to this, their different muscles act in various combinations, sometimes as associates, sometimes as antagonists, according to the manner in which the eyeballs require to be directed, so that their axes may meet at the object looked at, their centres of revolution coincide, and their vertical and horizontal diameters be parallel—conditions necessary for the simultaneous projection of the images of objects on the corresponding parts of the two retinae.

Mechanism of the Movements of the Eyelids.

At the same time that the eyeballs are so placed in the head and moved, that they may be directed to the various objects in the field of view, they are securely protected from any ordinary violence.

The upper eyelid is kept raised by a muscle for the purpose (the *levator*), whilst the lower eyelid is held down by its own elasticity and that of the cheek. There is a proper muscle for closing the eyelids, namely, the *orbicular*. The action of the levator muscle of the upper eyelid being suspended in sleep, it is partly by the weight and elasticity of the eyelid, and partly by the unrestrained action of the orbicular

muscle, that the eyes are kept closed. It is also by the momentary action of the same muscle every now and then that winking is caused; overcoming the action of the levator muscle of the upper eyelid and the elasticity of the lower, it draws down the upper, and raises the lower eyelid considerably.

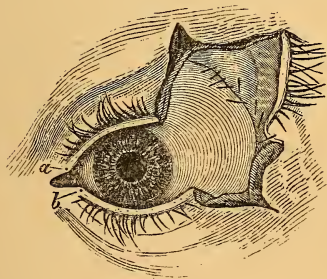
Mechanism of the Lachrymal Apparatus, &c.

For the lubrication and protection of the delicate and sensitive borders of the eyelids, an unctuous matter is poured out on their surface by the minute mouths of the ducts of the Meibomian glands. These mouths may be seen on close inspection of the surface of the broad border of the eyelids, arranged in a row all along.

The source of the tears is the lachrymal gland, which is situated above and to the outer side of the eyeball, securely lodged in a pit behind the edge of the socket. When the tears are poured out in unusual quantity, as they are in certain affections of the mind, and in consequence of irritation of the eye from the intrusion of foreign particles or the like, they run over the margin of the lower eyelid, and drop down the cheek. A flow of tears in a less degree is, however, constantly taking place, by which the transparent front of the eyeball and the surfaces of the conjunctiva in general are washed and maintained in a moist state. The direction in which the tears flow over the surfaces mentioned, is from above and near the outer corner of the eye, where the ducts of the lachrymal gland open and discharge them, downwards to the inner corner,

whence, as they accumulate, they are drawn off into the nose by the derivative lachrymal passages.

At the termination of the firm border of each eyelid towards the inner corner, there is a slightly prominent papilla, with a small orifice at its point. These papillæ are directed towards the pit or depression at the inner corner (named *lachrymal lake*), where the tears accumulate. By the two orifices which lead each into a small duct or canal, the tears are absorbed, and by the ducts are conveyed into the lachrymal sac which lies concealed under the skin, in a particular groove of the orbit, at the inner corner of the eye. From the lachrymal sac, the tears pass, by the nasal duct, into the nose.



An eye, with the eyelids divided vertically, and the outer halves everted, to show the orifices of the ducts of the lachrymal gland, into which hairs are inserted. The letters *a* and *b* indicate respectively the upper and the lower lachrymal points. Along the border of the eyelids are observed the Meibomian apertures.

The mechanism by which the eyelids are moved, and the tears drained away into the nose, is perhaps

most strikingly illustrated when it is anywise disturbed by disease. Thus the levator muscle of the upper eyelid is sometimes paralysed, in which case the upper eyelid hangs down over the eye, in consequence of the unrestrained action of the orbicular muscle. Again, the orbicular muscle may be paralysed, in which case the eyelids cannot be closed, the upper being kept elevated by its levator muscle, and the lower depressed by its own elasticity and that of the cheek. Then as to the draining away of the tears into the nose, this may be prevented by obstruction of the lachrymal passages; or by the tears not being absorbed by the lachrymal points, owing to the papillæ being no longer duly directed to the lachrymal lake at the inner corner, in consequence of paralysis of the orbicular muscle.

CHAPTER II.

CHOICE OF LIGHT FOR WORKING BY, AND GENERAL PRECAUTIONS TO BE OBSERVED IN THE EMPLOYMENT OF THE SIGHT.

LIGHT, we have seen, is the agent through the medium of which external objects make their impressions on the sense of sight. We know by experience that a certain moderate intensity of illumination is that by which we can see objects at once most distinctly and most comfortably.

Strong light dazzles and confuses the vision at the same time that it pains the eyes, determines the blood to them, and excites a flow of tears. It is only after some time, perhaps, that the eyes recover themselves. If the light has been very intense—the direct light of the sun concentrated, for example—the spot of the retina impressed may remain affected by it even to insensibility.

The attempt to exercise the sight by too weak illumination, on the other hand, strains and fatigues the eyes in a manner scarcely less injurious.

It is daylight alone which affords that degree and kind of illumination of objects which we find most agreeable to the eyes, and by which we can longest and with the least fatigue exercise the sight.

Artificial lights of all kinds are much inferior. The mild diffusion of the light of day, with the necessary intensity, uniformity, and steadiness, can be but imperfectly imitated in artificial light, which is usually either too concentrated or too weak and unequal and flickering in comparison. And then in respect to quality, what a difference is there to the eyes between working in the clear colourless light of day and the dingy red and yellow light obtained by combustion!

Our own natural feelings—a good monitor to be guided by in regulating the quantity and quality of the light to which the eyes are exposed,—warn us that work at all trying to the sight is best done by day. And to have daylight as long as possible for our work, we should follow the primitive fashion of rising with the sun. Work requiring least exertion of the vision may be done by artificial light. Students and others, therefore, who have to read and write much, should read by day and write in the evening. In like manner, seamstresses should do fine and dark-coloured work by day and coarser and lighter coloured work by candle-light.

The window by which we read, write, draw, sew, or do other such work should look towards the north rather than towards other directions. And the desk or work-table should be so placed that the light from the window may fall obliquely from behind and over the left shoulder on the book, paper, or work. By this arrangement the light does not fall directly into our eyes, nor is it reflected directly back from the object into them.

We ought never to exert the sight with the sun shining on the work.

As working in too weak a light is as injurious to vision as working in too strong a light, we must not continue poring over the book or seam when the light of day fails so that it is necessary to hold the object nearer in order to see it.

When we use artificial light for working by, it should be, as far as possible, sufficiently bright without being dazzling.

For reading, writing, or sewing by, the light yielded by two or three composite candles is, perhaps, the best. The light is sufficient in quantity, and, at the same time, mild and not very much coloured; and if there be no draughts of air in the apartment sufficiently uniform and steady. The candles should be placed to the left of the desk, and a little in front. They ought never to be placed directly in front, and still less brought between the eyes and the object looked at, as is sometimes done by far-sighted people.

If the room be large, it is well, in addition, to illuminate it generally, and for this purpose nothing is better than a moderator lamp, placed somewhere in the middle. If gas light be employed, the burners should be suspended from the middle of the ceiling and provision made for due ventilation. In either case the light should be moderated and diffused by means of an obscured glass globe. The light from lamps with opaque shades and the light concentrated by glass globes filled with water, as used by watch-makers, jewellers, and other such workmen, are by no

means favorable to the eyesight. They should be used, therefore, as little as possible.

Glaring and flickering lights irritate the eye even when not employed in any examination ; but when so employed such light is extremely detrimental. We should not read, write, draw, sew, or the like, under the shade of a tree for any length of time, as every now and then, in consequence of the motion of the leaves by the wind, streams of bright light alternately with shadows fall irregularly on the paper or seam. We ought never to attempt reading, nor indeed doing anything by the flickering light of a fire. Open cooking fires are bad for the eyes, both by their blinding light and radiating heat.

Much exertion of the eyes operates more prejudicially to the sight under some circumstances than under others. Exertion of the sight is especially prejudicial immediately after a full meal, after the use of spirituous drinks, while smoking, when the body is in a recumbent or stooping posture, when dressed in tight clothing, especially tight neckcloth, tight corsets, and even tight boots or shoes, in close ill-ventilated apartments lighted with gas, after bodily fatigue, during mental distress, late at night when sleepy, after a sleepless night, while the bowels are much confined, during convalescence from debilitating illness. Though during recovery from severe disease, the eyes cannot bear much exertion, yet, for want of other employment, it is not uncommon for convalescents to read even more than when in health. Many persons have very much injured their sight in this way.

Patients confined to bed are apt, from mere listlessness, to tire their eyes in tracing the pattern of the bed-curtains or of the paper-hangings on the wall.

Young growing persons, persons at the age of puberty, persons of weakly constitution, are incapable of supporting much exertion of the eyes without injury to the sight.

The eyes of children are often too much tried at school, and the ground is thus laid for future weak-sightedness of different kinds.

Reading and Writing.—In some cases, especially when the health is naturally good, or care is taken of it, and attention is paid to the conditions under which the sight may be most safely exerted, the eyes, though much tried, whether by daylight or by artificial light, will continue to stand exertion in reading and writing very well. In many cases, however, continued reading and writing, especially by artificial light, proves very hurtful to the sight, and reading more so than writing.

When we have to read much, we should not read very quickly. Reading a novel is more fatiguing to the sight than reading a historical narrative or scientific work, because in the former case we read faster; whereas, in the latter, thinking alternates with the use of the eyes in reading. Reading from a broad page with the lines long and the print small is very tiresome, as it is difficult for the eye always to take up the next line.

Writing down one's own thoughts, or to dictation, requires comparatively little exertion of the sight, not more than to see to place the words in proper order on the paper.

Copying is more trying to the eyes than even reading, as it is both reading and writing and looking backward and forward in addition.

It is not good to read or write at a flat table so that we are compelled to stoop. An elevated desk is better, especially one at which the student stands.

Reading in bed by daylight is injurious, but still more so is reading in bed by candle-light. The eyes are very much strained. The practice is especially prejudicial when one is weak after illness. Very obstinate asthenopy with pain, in a lady, was brought on by reading in bed during her confinement.

It is very trying to the sight to read when driving in a carriage, or when walking, as, on account of the constant motion, the eyes are compelled every moment suddenly to alter their adjustments. If there be sunshine, the circumstances are still worse, for at one time the page may be shaded by the body, and at another, in consequence of a change of position, it may be brightly illuminated by the light falling directly on it.

In the course of a long journey it is better to suffer *ennui* than strain the eyes by reading.

A distinguished mathematician, in an article on printed tables, expresses himself as "decidedly of opinion that the substitution of dull and rather dark paper for the bright and shining material now in general use, which dazzles the eye too much, is very desirable. Tables," he remarks, "should not be hot-pressed, and not even pressed at all. The mischiefs of pressure are twofold; first, the smooth surface

thereby created makes the page a kind of mirror which has a bright image in one place, whereas rough paper dissipates the light equally in all directions; secondly, the other side of the leaf shows through much more after pressure than before. It is also a mistake to suppose that great blackness in the ink, combined with great whiteness in the paper, is favorable to the reader. Every increase of the contrast, over and above what is necessary to perfect legibility, is injurious to it; jet upon snow would in time destroy the strongest eyes. Of all the things meant to be read, a black monumental inscription on white marble in a bright light, is about the most difficult. One would suppose, to look at our specimens of expensive printing, that such an inscription was the model which it was intended to imitate, and, if possible, to surpass. We are satisfied, after many trials and comparisons, that a dull paper, of a whitish-brown character, too thick to be seen through, and an ink which is of a dull brown black, as it were, the very deepest shade of the colour of the paper itself, are the things which are permanently agreeable to most eyes. Those who try it should remember that the first page read is not so good a test as the hundredth.

“One of the most legible books we know of is the trade edition of Gibbon’s ‘Decline and Fall,’ &c., in 12 vols., 8vo, London, 1820. It is considered by the booksellers themselves to be very badly executed. But printers and publishers are too much in the habit of forgetting that a book is a book, and not a line engraving. They look at the page as a whole, and if the individual lines stand out and make their

separate existences too perceptible, they pronounce it ugly. Accordingly, the uglier they hold it to be, the more legible the reader will pronounce it.”*

The cautions above recommended to be observed for the preservation of the sight in reading and writing, are in all respects applicable to sewing and other similar employments. Unfortunately, however, it too often happens that workpeople cannot help themselves, and their sight is sacrificed to the necessities of their circumstances.

* Article ‘Table’ in the National Cyclopædia of Useful Knowledge. London, Charles Knight, 1850.

CHAPTER III.

DANGERS TO THE SIGHT TO BE PARTICULARLY GUARDED AGAINST.

Injuries of the Eyes.

CHEMICAL or mechanical irritation of the eyes excites closure of the eyelids, and the discharge of a flood of tears. If the irritation have been produced by a substance in the state of vapour, the eye is, in this way, protected from its further action and the smarting soon subsides. Strong acid vapours, however—of nitrous or hydrochloric acid—may at once produce serious injury of the cornea.

Particles of dust are sometimes washed out by the tears, the discharge of which they have excited, or may be found after some time lying enveloped in mucus in the inner corner of the eye, having been carried thither by the movements of the eyelids and the stream of tears. A foreign particle is very apt to adhere to the inner surface of the upper eyelid, where it causes great pain by being pressed against the surface of the eyeball. On raising and everting the upper lid, the offending particle will be discovered, and may be removed with a bit of paper. Foreign bodies within the lower lid can be more easily detected and removed.

Foreign particles often adhere to the front of the eyeball, generally the surface of the cornea. This often happens to workmen in various operations; ignited sparks called *fires* projected against the eye sink into the substance of the cornea.

If the removal is effected soon, the distress is in general relieved, or greatly mitigated. Sometimes a sensation remains as if the body were still in the eye, owing to abrasion of the surface. Lime is very fatal to the eye. Slaked lime less so than quick lime.

Abrasion of the cornea is sometimes produced by a scratch of the finger nail or by awkward attempts to remove a foreign body, or it is the result of a stroke with a twig or an ear of corn, an accident to which reapers are much exposed. A severe form of inflammation of the eye is often excited by such an abrasion.

In passing through a wood, a rebounding twig is apt to strike the eye. Even a slight stroke will sometimes occasion cataract or amaurosis.

Though recovery from the immediate effects of severe injury may take place, the eye is not yet quite safe, for after some weeks an internal inflammation may arise, not only of the injured but also of the uninjured eye.

This inflammation of the uninjured eye, called sympathetic ophthalmia, is very dangerous to the sight. Sympathetic ophthalmia having proved hitherto little amenable to treatment, the greatest attention should be paid to every case of ophthalmia from an injury, however slight apparently at first, in the hope of obviating an attack. And after the cessation of the inflammation in the injured eye, especial care should

be taken by the patient not to use either eye much for a considerable time to come.

When a foreign body has got into the eye, prolonged attempts to remove it by an incompetent person should not be permitted ; but the patient should forthwith obtain the assistance of a surgeon. In general, the foreign body may be at once discovered and removed with the greatest ease and with little or no pain. Scraping the cornea in attempts to remove a particle adhering to its surface is, as above mentioned, likely to excite a most dangerous inflammation of the eye.

Accidents often occur from arrows and other projectiles, with which boys play, striking the eyes. Such games should be prohibited where people are passing to and fro.

Prejudicial reaction of certain states of the Body on the Eyes.

Suppression of the perspiratory action of the skin is, as is well known, very dangerous to the health in general. It is so likewise to the sight. We ought, therefore, while perspiring, to guard against being chilled. The state of the skin, indeed, exerts as important an influence, for good or evil, on the eyes and sight as on any other organ and function of the body.

Amaurosis has been brought on by sudden suppression of perspiration of the feet, and it is not at all uncommon for persons when chilled to be seized with

a catarrhal or rheumatic ophthalmia. If this occurs even to the healthiest, how much more readily will the eyes be affected when already predisposed either by natural delicacy, by previous over-exertion, by disordered digestion, &c.

In addition, therefore, to the great requisites for the preservation of the health of the eyes, as well as of the body, namely, wholesome and sufficient food (a person, it is to be remembered, may eat too little as well as too much), with temperance in strong drinks, regularity of the bowels, exercise in the open air, a due amount of sleep (say eight hours), attention to the state of the skin is of the utmost importance.

Sponging and rubbing the skin daily are always most beneficial, and when sufficient exercise in the open air cannot be had they are indispensable. Combined with proper clothing, flannel next the skin, and the outer garments adapted to the season, neither too thin in winter nor too thick in summer, friction of the skin renders us less susceptible to catarrhs, rheumatism, &c.

In persons advanced in life, with eyes already in a state of congestion, a chill is apt suddenly and dangerously to affect the sight. In such persons also, if they have been long troubled with bleeding piles, the suppression of the discharge is to be carefully guarded against, as further injury of the sight is very apt to follow.

Again, when, in consequence perhaps of costiveness, there is already a disposition to determination of blood to the head and eyes, the effort of straining at stool, especially in the case of old persons, is very apt to

aggravate it and to injure the sight in various degrees even to amaurotic blindness.

Here it may be observed, in regard to straining at stool, that in consequence of a swollen and congested state of the lower end of the rectum, which often exists in costiveness, the feeling may be occasioned as if there was something to be expelled, when in reality there is nothing. And so straining is unnecessarily and injuriously persisted in.

In making great bodily efforts, the blood may be so determined to the head and eyes that the pressure occasioned by the gorged blood-vessels on the retina will excite in the person the sensation as if light flashed from his eyes. And it is to be remembered that if a first effort does not produce permanent injury of sight, repeated efforts may.

In fits of sudden passion, blindness is apt to be occasioned by determination of blood to the head and eyes.

Exhaustion of the system from prolonged suckling is a not uncommon cause of injury to the sight. So also great loss of blood, venereal excesses, and the like.

Ophthalmia, or Inflammation of the Eyes.

The eyes are apt to be very materially injured in their structure by inflammation, and the sight correspondingly impaired or destroyed. The cornea may be left more or less opaque—the pupil closed or contracted—the retina more or less insensible to the impression of light.

Without having suffered such a degree of injury,

the eyes may, nevertheless, be left, by repeated attacks of inflammation, so irritable as to be incapable of use.

How important, therefore, is it to prevent the occurrence of inflammation of the eyes, or to cure it speedily when it has occurred !

The practical advantage of being acquainted with the causes of inflammation of the eyes, is to know how to avoid them, and thus to prevent the inflammation; or if they have already produced inflammation, to know how to remove them, if still in operation and removable.

The causes of inflammation of the eyes may be referred to three heads, viz.: 1st. Those which operate directly on the eye; 2d. Diseases of other parts with which the eyes sympathise, or which spread to the eyes; 3d. States of constitution and constitutional diseases which, though they do not necessarily determine inflammation of the eyes, at least predispose them to be affected by other causes, and modify inflammations thereby excited.

To the first head belong—injuries of the eye; exposure to wind and cold; direct action of very strong light, or of this and strong heat together; over-exertion of the sight, especially in bad light, either too weak or too strong, with much stooping of the head; the direct influence of acrid vapours and contaminated air; epidemic or endemic influences; the direct application of contagious matter.

These are all exciting causes, but some of them require to be assisted by other causes, so that they operate partly as predisposing causes also.

To the second head belong diseases of the skin;

especially the exanthematous diseases, as smallpox, measles, scarlet fever.

To the third head belong scrofula, rheumatism, gout, and syphilis.

In the treatment of inflammation of the eyes, the first points to be attended to by the patient (besides, as a matter of course, the removal of the exciting cause, if still in operation and removable) are the protection of the eyes from everything which can cause or keep up irritation—such as using them or exposing them to strong light, and the avoidance of whatever is calculated to operate injuriously on the system in general, such as exposure to the weather, excessive corporeal exertion, errors of diet, &c.

In some inflammations of the eye there is great intolerance of light; in other inflammations there is little or none at all. When the intolerance of light is great, the patient may be kept in darkness. But it is to be borne in mind that long exclusion of the light renders the eyes unduly sensitive. During convalescence, therefore, even though the eyes be still more or less impatient of the light, the room occupied by the patient should not be quite darkened. It will be sufficient to moderate the light by the blinds and curtains. Under such circumstances, a blue, green, or grey tint of the walls of the room best suits the eyes. Bright-coloured objects should be removed from the room.

Use and abuse of Eye-waters, Salves, and Warm and Cold Applications to the Eyes.

It is a vulgar error, and a very serious one, to suppose that eye-waters or salves are the appropriate remedy for every disease of the eyes, no matter of what kind. In internal inflammations of the eyes, the common irritating eye-waters and salves are both useless and destructive; and this not only by the direct injury inflicted, but as leading to a neglect of the proper general treatment. In the mere superficial inflammations, on the contrary, more good is often effected by means of such applications than by any other kind of remedy.

There are two substances in very common use as ingredients of eye-waters, viz., sugar of lead and lunar caustic, in regard to which a caution is necessary.

A solution of sugar of lead is a popular eye-water, and in certain cases it would be an useful enough application, if it had not the insuperable objection of leaving an opaque white deposit on the surface of the cornea, if abraded. This bad effect may result even from a single application, and cannot be prevented.

A solution of lunar caustic, again, dropped into the eye is, in numerous cases, a most valuable application, and, unlike sugar of lead, is not followed by any bad result if at all judiciously employed. But, it often happens, either from carelessness or ignorance, that the application is misused by being persisted in for a long time; the effect of which is, that the white of the eye and the inner surface of the lower eyelid are

permanently dyed of a dark olive hue, or actually black, whilst the inflammation, for which the remedy was prescribed, is rendered chronic and incurable.

In applying eye-waters, an eye-glass is not to be recommended. It is best to bathe the eyes simply by means of a bit of soft linen rag, taking care to let the eye-water run into the eyes, and, by moving the eyelids upwards and downwards, to bring it freely into contact with their inner surface.

Patients should not of their own accord use any application to their eyes but water. In regard to whether the water should be cold or warm, it is to be observed that, in general, the cases in which cold water is best adapted are, certain superficial inflammations, floating muscæ and various irritable states of the eye; whilst, on the contrary, in all internal inflammations of the eyes, &c., warm water is preferable. No precise rule, however, can be laid down on the subject; but it may be observed that, in general, the feelings of the patient constitute a good guide for the choice.

Cold spring-water is the best cold lotion. It is applied by means of compresses of old linen or lint, which should be broad enough to extend over the neighbouring parts as well as over the eye, but not so heavy as to press unpleasantly. When once commenced, the application of the cold lotion requires to be assiduously kept up as long as is necessary, one compress as soon as it becomes warm, being replaced by another just taken out of the water.

The *cold douche bath* consists in a fine stream of cold spring water, allowed to play on the closed eye

and neighbouring parts. Particular douche apparatuses are advertised and puffed, but the jetting of cold water on and into the eyes is, after all, little better than a mere bit of trifling.

In the weak and rheumy eyes of old persons, and in a similar state remaining after an attack of ophthalmia, it is often agreeable, and, indeed, productive of great relief, occasionally to draw some cold body across the eyelids. For this purpose a long slender bottle, with a smooth round bottom, filled with ice, has been recommended.

As warm applications to the eye, fomentations are much more convenient and elegant than poultices. Warm water simply may be used for the purpose, or chamomile decoction, poppy decoction, and the like. The application is made by means of compresses, as just described for cold lotions. The application requires only to be made occasionally, and that merely for a period of from five minutes to a quarter of an hour at a time. Warm cataplasms and fomentations should never be allowed to become cold on the eyes. After their removal, the eyes are to be gently dried with a soft linen cloth, and care taken that they be not exposed to a draught of air.

Warm have the great advantage over cold applications, in that they leave the eyes, for some time after, pleasantly cool and soothed; whereas, if the cold application be intermitted, the increased heat in the eye which supervenes is most distressing.

PART II.

DEFECTS OF SIGHT IN PARTICULAR.

THE diseased state of the eyeballs occasioning defective sight may consist, either in derangement of the dioptric apparatus in front of the retina, or in an affection of the retina itself, optic nerve, or brain.

In some cases, the derangement of the dioptric apparatus occasioning the defective sight complained of is very evident, consisting of opacity of the cornea, obstruction of the pupil, cataract, &c. In other cases, there is no defect of the eye perceptible to simple examination. Testing of the sight by glasses, &c., is then necessary to ascertain whether or not the defective sight be owing to derangement of the adjusting powers of the eye.

When it has been determined by direct exploration of the eyes, that the defective sight does not depend on opacity of the cornea, obstruction of the pupil, cataract, or the like, nor, by the tests just referred to, on deranged adjustment, then there is reason to fear an amaurotic affection, consisting in perverted, impaired, or lost sensibility, from disease implicating the retina, optic nerve, or brain.

There are cases, it should be observed, in which some defect both of the dioptric, and optic nervous apparatus exists.

But with eyes otherwise sound, there are cases of disturbance of sight arising from loss of correspondence in the direction and movements of the two eyeballs.

Again, though there may be none of the defects above mentioned, and though the sight may be in reality quite good, it often happens that it cannot be properly exercised in consequence of some chronic inflammation or other disease of the accessory parts of the eyes, such as the eyelids or lachrymal organs.

These great classes of defective sight, though so different in their nature, are, in many of their kinds, species, and varieties, popularly confounded under the common name of *weak sight*.

CHAPTER I.

DEFECTIVE SIGHT DEPENDING ON DERANGEMENT OF THE DIOPTRIC APPARATUS OF THE EYES.

THE derangements of the dioptric apparatus of the eyes, it has been above stated, consist, some in opacity of the cornea, obstruction of the pupil, cataract, and the like, whereby the light is interrupted in its passage to the retina; others, in a want of adjustment.

Of the defects occasioning interruption of the passage of light to the retina, I pass over opacity of the cornea and obstruction of the pupil, which are effects of inflammation, and can be prevented only by preventing the occurrence of inflammation, or by quickly curing it, when it has occurred.

Here, I shall only speak of cataract—its nature, its cure by operation, and the question of its prevention or treatment without operation.

Cataract.

Cataract is manifested by a grayness or whiteness in the pupil, which is naturally of a clear black, and consists in a greater or less opacity of the crystalline lens, whereby the rays of light are, in a proportionate degree, intercepted on their way to the retina. The consequence is, that vision is more or less impaired, or even reduced to a perception of light and shade.

Different kinds of cataract are recognised by surgeons, and the distinction of one from the other is a point of no small importance, for on it depends a correct conception of the rise and progress of the disease, and, especially, the discrimination of the operative procedure best adapted to effect a restoration of sight in a given case.

Cataract, as above defined, is sometimes distinguished by the epithet *true*, into contradistinction to what has been called *false* cataract, which consists in opaque deposits of lymph, matter, blood, &c., on the crystalline body, obstructing the pupil—the consequence commonly of anterior internal inflammation of the eye neglected or mistreated. False cataract, however, may be combined with certain kinds of true cataract.

Relative frequency of Cataract at different periods of life.—

From 1 to 10 years	14
„ 11 20 „	16
„ 21 30 „	18
„ 31 40 „	18
„ 41 50 „	51
„ 51 60 „	102
„ 61 70 „	172
„ 71 and upwards	109

500

Lenticular cataract or opacity of the proper substance of the crystalline lens constitutes the typical example of cataract; and whilst it is the most com-

mon kind, it is fortunately that which admits of the most ready and perfect cure.

In older persons, the opaque lens is hard; in younger persons, soft.

Hard or Common Lenticular Cataract of old persons.

From fifty years old, and upwards, is the age of the majority of persons, it will be seen from the above table, who present themselves with cataract, and in them the cataract is usually more or less harder than the lens naturally is.

When the cataract is pretty fully formed, every thing right before the patient generally appears to him as if obscured by a thick cloud or gauze. In bright light, which causes the pupil to contract, vision is still more indistinct; in moderate dull light, which allows the pupil to dilate, it is less so. The opposite of this, however, sometimes occurs, viz., that the patient sees as well in a strong, as in a dull light, sometimes better. Lastly, objects may not be seen at all; but vision may be reduced to a mere preception of light and shade.

The peculiarities in the state of vision now enumerated, present themselves according as the opacity is greater or less in the centre opposite the pupil, than at the circumference of the lens, or as it is equally great in the centre, and at the circumference.

When the pupil is dilated by belladonna, or its active principle, atropia, vision is still more decidedly improved, as the dilatation produced is greater than that which takes place in dull light.

The dimness of sight and opacity in the pupil, in

general, begin in a very unmarked manner, and increase slowly, for perhaps months or years, until they have attained the degree above described. Usually, one eye is affected first, and by and by the other. In rarer cases, both eyes become equally affected at the same time.

Lenticular cataract of old people consists in a shrivelling of the fibres, and a granular state of the interfibrous material of the proper substance of the lens. It may be looked upon in some degree as a natural change with the advance of life, analogous to the hairs becoming gray or white. But there are some circumstances which especially predispose to the complaint, such as hereditary tendency, rheumatic constitution, habitual exposure to strong fires, &c.

When once begun to form, it may be prognosticated, that the opacity will go on to increase until all useful vision is prevented in the eye. And it may also be prognosticated, that the other eye, if not already affected, will become so likewise. How rapid or how slow the progress to loss of useful vision may be, cannot, however, be prognosticated—it may be months, or it may be years.

Restoration of vision can be effected only by an operation, by which the opaque lens shall be removed from its situation to below the level of the pupil (*the operation of displacement*), or extracted from the eye altogether (*the operation of extraction*).

These operations have for their common object the removal of the opaque body from behind the pupil, so that the rays of light may be again allowed to pass on to the retina.

To make up for the loss of the crystalline lens, the use of spectacles, with strong convex glasses, is required after recovery from the operation.

In cases fit for the operation, a successful result may be expected in a large majority. Perhaps, out of twelve cases operated on, excellent sight may be recovered in eight, less good sight in two or three, whilst one or two will prove unsuccessful.

When in one eye useful vision is lost, and in the other, vision has become dim from cataract, it is advisable to operate as soon as possible on the blind eye, in order, that this may be fully recovered by the time the opposite eye is so blind as to require the operation.

When in an elderly person, double lenticular cataract has become so far developed as to interfere with useful vision, the operation should be had recourse to as soon as possible, if extraction is the operation to be performed, for there is more chance of a successful result than at a later period; if, on the contrary, displacement is to be performed, the operation may be delayed, if the patient prefers it, without disadvantage.

When cataract is fully formed in both eyes, both may be operated on at the same time, though it is better to operate on one only at a time, if extraction, and on both, if displacement, be the operation to be performed.

The older surgeons laid great weight on what they called *ripe* and *unripe* cataracts—that is, cataracts fit for operation, and cataracts not yet fit. And among non-medical people the distinction is still talked of.

It was supposed that the opacity depended on the coagulation of a fluid; and until this process was judged to be sufficiently advanced to permit of the concretion being displaced by the needle, the cataract was deemed unripe. This was an erroneous notion of the nature of the disease; but the practice recommended was in some degree founded on a pathological fact, not however understood.

The operation, in reference to which the distinction of ripe and unripe was made, was couching or depressing the cataract. Now, in the cataract of old people, when the opacity of the lens is fully formed, there is, at the same time, softening of the vitreous humour, and the connections and bands by which the lens is held in its place are so loosened, that it is easy with the cataract needle to depress the lens, by tearing the loosened connections and bands, into the softened vitreous humour.

In an early stage of the cataract, the connections of the lens are still firm and the vitreous humour unsoftened, so that the opaque lens does not admit of being so easily depressed, and if forced down it is apt again to rise. This constitutes unripeness of the cataract.

Ripeness and unripeness of the cataract has no bearing on the operation of extraction, unless it be in a contrary sense; for when the cataract is very ripe for couching, the case is not very safe for extraction on account of the softened state of the vitreous humour; whereas, when the cataract is as yet unripe for couching, the eye is in the fittest state for extraction. Hence it is advisable, if the operation of extraction

is to be performed, to operate as soon as the dimness of sight is such as to call for interference.

Preparation of the Patient for undergoing an Operation for Cataract.—If the case be free from local or constitutional complications, the patient requires no other preparation than a few days' rest of mind and body, some attention to diet, and to the state of the bowels. If, on the contrary, any such complications exist, he ought, before the operation is undertaken, to be subjected to such treatment as is adapted either to remove them altogether, or to palliate them so far as to remove or diminish the risk of their interfering to prevent the success of the operation. The previous habits of the patient as to diet, the use of strong drinks, smoking, &c., should be carefully considered.

In very timid patients chloroform may be occasionally resorted to, at least in operations with the needle. The vomiting which is apt to supervene is a strong objection to its employment in extraction.

Seasons of the year best adapted for Operations for Cataract.—Operations for cataract may be performed during mild and steady weather at any season; and such weather usually occurs from March to the end of October.

Position of the Patient.—The patient may either sit on a chair, or lie extended on a sofa or table with a pillow under his head.

In operating on the eye, it is of the greatest moment to have good light. A window directed to the north should, if possible, be chosen. If there be more than one window in the room, the others should have the curtains drawn.

Opening and securing of the eyelids.—The patient, assistant, and operator being in their places, the next business is to open and secure the eyelids. The proper securing of the eyelids is a most important point. As some uneasiness attends this, the patient is apt to flinch at it. It is, therefore, advisable to accustom the patient to the necessary handling of the eyelids in opening and securing them by practising the manipulation daily for two or three days before the operation, the patient being at the same time seated as it is proposed he should be at the time when the operation is actually performed.

Extraction of the Cataract.

In the common hard lenticular cataract of old persons, the operation it is most advisable to perform, when circumstances admit of it, is extraction through an incision in the cornea.

The operation is a nice and difficult, though not painful, one, and for its success an otherwise healthy condition of the eye is of great importance. Steadiness on the part of the patient during the operation diminishes to the surgeon the difficulties attending its performance, whilst after the operation, it is calculated to promote the healing process and to ward off the occurrence of such accidents as are apt to interfere with that process, and so mar success. On the other hand, among the conditions unfavorable to, or wholly forbidding the performance of the operation, is restlessness on the part of the patient, chronic cough, and difficulty of breathing.

When the case is one of common hard lenticular

cataract, and when the other conditions are favorable the prognosis is good. Recovery of the eye from the effects of the operation sometimes takes place in less than three weeks; but not unfrequently some degree of external, or even anterior internal inflammation occurs, so that recovery is retarded. In general, convalescence should not be calculated on sooner than from four to six weeks. . Sometimes, although the case appeared to be in all respects a proper one, and the operation well and successfully performed, the healing process does not proceed favorably, and sight is not restored.

The operation having succeeded as an operation, more perfect vision is in general obtained after extraction than after any other mode of operating.

The operation of extracting a lenticular cataract, through an incision in the cornea, may be viewed as comprehending two principal steps, viz., 1st, *the section of the cornea*; and, 2d, *the laceration of the capsule, and extraction of the lens*.

The mode in which the section of the cornea is made, is to pierce through the cornea on the temporal side into the anterior chamber, which constitutes the act of *puncturation*; then to push the point of the



knife, the flat surfaces of the blade being to and from the operator, through the anterior chamber, across to the nasal side of the cornea, where the point of the

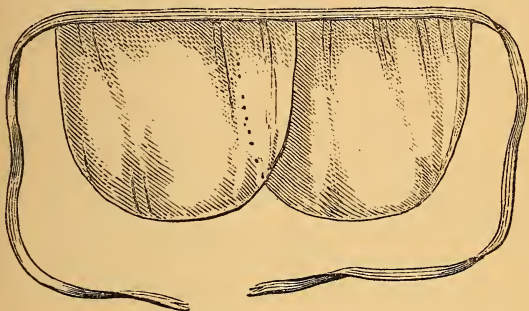
knife is again made to pierce through the cornea from the anterior chamber, an act called *counter-puncturation*. By now continuing to push the knife onwards, it, by its increasing breadth, *cuts itself out* in the direction of the dotted line (fig. p. 45) and so the section of the cornea is completed. The section of the cornea thus comprehends three acts, viz., *puncturation*, *counter-puncturation*, and *cutting out*.

In its natural state, the capsule, when punctured merely, will readily tear and allow the lens to escape; and although in lenticular cataract the same thing will often happen, it is proper not to trust to this, but to take pains to lacerate the anterior wall of the capsule freely.

It often happens that immediately on the laceration of the capsule, the lens begins to escape; if it does so, the surgeon at once proceeds to help it out; but if it does not, the eyelids are allowed to fall together for a minute or so before the extraction is proceeded with.

The lens having been extracted, the eyelids are again allowed to close. And, after a minute's rest to the patient, the surgeon gently opens them to see if the iris and flap of the cornea are in their proper position. If the iris and pupil do not appear to be quite right, the upper eyelid is allowed to close, and is to be rubbed gently with the finger over the front of the eyeball, and then quickly opened to the light, when the iris will contract, and will thus, along with the pupil, be brought into a proper situation. This being the case, and the flap of the cornea in accurate apposition, the eyelids are to be closed, first the upper and then the lower.

After the operation, both eyes are to be kept closed, and for this purpose a narrow strip of court plaister, extending from the eyebrow to the cheek, is to be applied over the eyelids on each side ; whilst, over all, a shade composed of a fold of soft linen, to which is fixed a tape to tie round the head, thus, is to be hung.



Another method of bandaging is, to lay over the eyes, when closed, a light fold of linen, and secure it by a band, the middle of which is laid over the nape of the neck, and the ends brought round over the eyes, crossed on the forehead, and pinned to each other behind.

The patient need not be put to bed immediately after the operation, unless he desires it, but may recline on an easy chair or sofa, until about his usual bedtime. The room should be somewhat darkened, and perfect quietness observed in the house. The patient should refrain from speaking, and endeavour to keep himself as composed as possible. His food should be so prepared as not to require much chewing.

At bedtime an opiate should not be omitted, if the patient is in the habit of taking one to procure sleep; if not in the habit, an opiate is to be given only if the patient is restless.

During the night, the patient requires to be watched, lest by turning in bed or rubbing the eye with his hand while asleep, the eye should be injured. A good precaution is to secure the patient's hands to his side, so far that they may be prevented from being carried to the eye.

The patient should not go to stool for the next day or two succeeding the operation, if this can be avoided. If not, he ought to bear well in mind to move with the greatest caution, and that he must not make the slightest straining effort. Irremediable injury to the eye, by protrusion of the iris, &c., has been the result of such want of care. After forty-eight hours, some laxative medicine may be taken.

The patient should lie on his back, or on the side opposite that on which the operation has been performed, until at least the third day, when, if matters go on well, he may sit up in bed. On the fourth day, he may be allowed to get out of bed for a few hours in the afternoon.

During the twenty-four or forty-eight hours succeeding extraction, the patient feels as if he had received a blow on the eye, and also from time to time experiences a slight smarting and pressing sensation, which is always relieved when a watery fluid escapes from the eye. From this and encrusted Meibomian secretion, the eye is to be from time to time carefully cleansed with tepid water and a soft linen rag. The

eye is not to be opened until the third, fourth, or fifth day, but that things are going on well may be inferred if there is no pain, and the upper eyelid neither red nor swollen. On the third or fourth day, after the borders of the eyelids have been cleansed from any adherent matter, by means of tepid water and a bit of soft lint, as just mentioned, and the strips of black court plaister, if they have been used, removed, the eye may be opened and looked at, but closed again, and so on from day to day, until the ninth or tenth. After that, the eyes being protected by a shade, the patient may freely open them.

The corneal incision heals in the course of two or three days, or even sooner, if there is nothing to prevent union by the first intention, such as prolapse of the iris, with or without prolapse of the vitreous body, or non-apposition of the edges of the incision. The incision, when enlarged by scissors, is apt not to heal completely by the first intention.

Untoward occurrences during the operation.—Protrusion of the iris may take place on the completion of the section of the cornea, and again after the lens has been extracted. But if uncomplicated with escape or protrusion of vitreous humour, the protruded iris is in general easily replaced. The protrusion of the iris, which is apt to occur subsequently, is much more to be dreaded.

When the vitreous body is of its natural consistence, and its connections unweakened, as in young persons, there is little danger of its escape. With the advance of age, however, softening of the vitreous body and its connections, as above observed, tends to take

place; hence it is that in the operation at present under consideration, viz., extraction of the common hard lenticular cataract of old persons, bursting out of the vitreous humour, with or without the lens, is apt to occur.

In a case of bursting out of the lens, together with a greater or less quantity of vitreous humour immediately on completing the section of the cornea, the operation is completed, and whether it is likely to be followed by a good or bad result will, in a great measure, depend on the quantity of vitreous humour lost. If the quantity does not exceed one fourth, it is possible for the eye to recover with pretty good vision; if more is lost, such an event is not to be hoped for.

In any case, the mode of procedure is to close the eyelids immediately, and leave things to nature. Under the most favorable circumstances, the wound of the cornea heals slowly, and the pupil is dislocated towards the cicatrice. Still, good vision may be restored.

Should the vitreous humour begin to escape without the lens, the small hook is immediately to be introduced, and the cataract hooked by its lower edge, and brought out as quickly as possible.

Untoward occurrences after the operation.—Though the cataract have been extracted without accident, and though when the eye is bound up everything appears right, untoward occurrences may yet take place. Inflammation, both external and anterior-internal, acute or slow, may arise; in either case impeding the union of the corneal incision and disposing to protrusion of the iris.

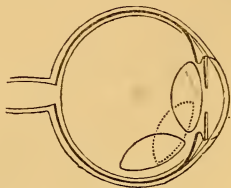
It has been above stated that protrusion of the iris is apt to take place at the time of the operation; but though such has not occurred, the eye is not yet safe from that accident, for in the course of the three or four days following the operation, the iris may yet protrude. This secondary protrusion of the iris may be occasioned by some such effort as straining at stool, or coughing, but it is generally owing to non-union of the corneal incision, and swelling of the iris, occasioned by supervening inflammation, or by extravasation of blood.

Nothing should, in general, be done directly. If the protruded iris be large and appear to be much distended by fluid behind, the propriety of puncturing it, or even snipping it off, may come to be a question. As the inflammation subsides, the protrusion sinks, and the iris will be involved in the cicatrice of the cornea, which will be broad and unsightly, whilst the pupil will be displaced and contracted, or altogether closed. By and by, touching the protruded iris once a day or every second day with the nitrate of silver pencil, will promote cicatrization. This may even be done from the first, if, instead of inflammation, there is defective action in the part.

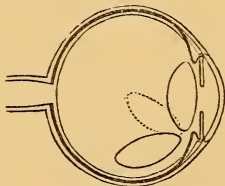
Displacement of the Cataract.

There are two modifications of the operation of displacement, viz., *couching* or *simple depression*, and *reclination*. In the one case the displaced lens has its anterior surface downwards and somewhat forwards,—its posterior surface, upwards and somewhat

backwards,—its superior edge forwards and somewhat upwards,—its lower backwards and somewhat downwards, thus :



In the other case, the displaced lens has, at the same time that it was depressed, been made to turn back on its lower and outer margin, so that, its upper edge being forced back into the vitreous humour, its anterior surface comes to be uppermost, its posterior surface directed downwards, thus :



Both couching and reclination of the cataract are usually effected by introducing the cataract-needle through the sclerotica, that is, by *sclerotic puncturation*.

Reclination effecting all that couching can, and being in every respect a better operation, couching has altogether fallen into disuse.

The kind of cataract best fitted for displacement is

the same as that best fitted for extraction. Whether or not therefore displacement should be performed instead of extraction will depend upon the absence of the conditions necessary for, or at least favorable to the successful performance of extraction or the existence of the conditions unfavorable to, or wholly forbidding it.

The displaced lens, if disengaged from its capsule may eventually disappear, or be reduced to a small size by solution and absorption, especially in persons of less advanced age—say about fifty—and when the cataract is not very hard. In many cases, however, it does not dissolve, and is always apt to rise again.

The light fold of linen, to hang over both eyes, is sufficient bandage. In other respects the same general management is to be adopted as above recommended after extraction.

In the course of a few hours after the operation, vomiting sometimes occurs. Reascension of the lens may be thereby occasioned.

Acute internal inflammation of the eye is apt to be excited by the operation. Most frequently, however, the supervening inflammation is of a chronic character, ending in disorganization of the eye and loss of vision.

Soft or common lenticular Cataract of young people.

This cataract is of the same consistence as that which is natural to the lens, or softer, and of a grayish white, or milk and water opacity.

Vision is diminished in proportion to the opacity,

in a manner analogous to what is above described to be the case in hard cataract.

The occurrence of opacity of the lens in young persons is very much rarer than in old persons. It is often met with as the result of injury. In children affected with lenticular cataract, we are sometimes told that the opacity made its appearance after convulsions. In other cases it cannot be traced to any cause. Frequently, it is congenital.

It is to be remembered that this form of cataract is not unfrequently complicated with amaurosis.

The kind of operation best adapted for the removal of soft lenticular cataract is that by *division*, in order to its solution and absorption.

Division of the Cataract.

The object of this operation is to lacerate the capsule and break up the lens, so that the latter, being freely exposed to the action of the aqueous humour, may be gradually dissolved and absorbed, and thus altogether removed from the eye.

Considered as an operation, division is the most simple of all those for cataract, both in performance and in the extent of injury necessarily inflicted on the eye.

In the cases proper for the operation, the prognosis is good. There is in general little inflammatory reaction, but though the lens may be perfectly absorbed, the capsule, which does not admit of solution and absorption, if not already opaque may become so, and form what is called *secondary capsular cataract*. To

anticipate this, the anterior wall of the capsule should, during the first operation, be as completely cut up as possible at the part corresponding to the pupil. The rapidity with which solution and absorption go on varies from a few days to several months. In general it may be said that in children the absorption proceeds more quickly than in adults.

One operation may suffice; but, generally, solution proceeding slowly, the operation requires to be repeated, and that more than once. This, as the operation is so simple and painless, is no great objection. The interval between the repetitions of the operation should be about six weeks.

It is best to operate on both eyes at the same time. I have observed that solution proceeds more quickly after the operation on both eyes at the same time than after the operation on one eye only. When the eye becomes inflamed, solution appears to be arrested.

If the retina was previously quite sound, a perfect restoration of vision may be calculated on, if solution and absorption go on pretty quickly; if not, by the time the cataract disappears, the sensibility of the retina may be found impaired.

The treatment after division is the same in general as after displacement, except that the pupil is to be kept dilated.

Secondary Cataract.

After the operation of extraction, some portion of the cataractous lens may remain obstructing the pupil, forming what is called *secondary lenticular cataract*

In such a case no interference is in general required, the lenticular fragments being eventually absorbed. The posterior strata of the lens, both opaque and firm, sometimes remain adhering to the posterior wall of the capsule, and show little disposition to become absorbed. In such a case I have found it necessary to have recourse to the operation of division some months after the extraction had been performed.

After the operation of extraction of the lens, but especially after division, the capsule is apt to become opaque and obstruct the pupil. This forms secondary *capsular* cataract. The operative procedure for secondary capsular cataract depends on the particular circumstances of each individual case.

Comparative advantages and disadvantages of Extraction, Displacement, and Division.

By the operation of extraction, the cataract is removed wholly and at once from the eye, and very good vision restored; but the operation is a nice, if not a very difficult one, and liable to the occurrence of the various untoward circumstances above mentioned, by which its success may be marred.

The operation of displacement, which may be performed in the same cases as extraction, is neither so nice nor so difficult an operation, and does not expose the eye to the same immediate risks; the cataract is, indeed, apt to return to its former place, but the operation may be repeated. After displacement, however, though the operation may have succeeded, and vision be restored, the eye is not so safe as after

successful extraction; but, as above mentioned, is liable to become affected with internal inflammation, which may end in blindness.

Extraction thus possesses a decided advantage over displacement, and is therefore generally preferred, except when the unfavorable complications, above mentioned, exist.

The degree of softening of the vitreous body requisite to admit of safe displacement of the lens is not so great as to forbid extraction; but, of course, if in the cases in which the vitreous body is so much dissolved that the displaced lens is apt to float up again, displacement be contra-indicated, extraction is much more so.

All other things being equal, it might, perhaps, be laid down as a general proposition that in the very cases in which displacement admits of being most readily and safely performed, extraction is less safe, whilst, on the other hand, in the cases in which, in consequence of the soundness of the vitreous body, extraction is most safely and easily performed, displacement is least so.

As the cases for which division is best fitted are different from those in which extraction or displacement is indicated, there is no comparison to be made between them.

Palliative treatment of Cataract. Can Cataract be cured without an Operation?

In many cases cataractous patients have their sight temporarily improved by dilating the pupil with bella-

donna or atropia. Some, however, are dazzled by this. And in some, though benefit is obtained, congestion of the eye is induced.

There have been, and there are at the present time, persons who pretend to cure cataract without an operation ; and witnesses to their skill are not wanting, either in persons who allege to have been themselves thus cured of cataract, or in persons who aver that they are acquainted with those who have been thus happily restored to sight.

On the other hand, all medical men of reputation and experience in the treatment of the diseases of the eye, affirm that they have never known a case in which true cataract, when once formed, has been cured without operation, that is, in which the lens, having once become opaque, has been again rendered transparent, or at least been removed, either by the efforts of nature or by any kind of medical treatment.

In corroboration of this, I have to add my testimony, and at the same time declare my belief, that the allegations that cataract has been cured without an operation are some of them false, whilst others are founded on ignorance and mistake as to the nature of the cases treated as cataract.

Persons, by applying belladonna to the really cataractous eye and thereby dilating the pupil, have improved the sight for a time, and have called this *curing* cataract without an operation.

Another trick has been to puncture the eye and lacerate the capsule with a fine needle without the patient's knowledge, and to continue various applications, whilst all the time the cataract was disappear-

ing by absorption in consequence of the operation of division thus clandestinely performed.

Again, specks of the cornea have been called cataract, and as these frequently admit of being removed by treatment, the case has been put down as cataract cured.

Lymph in the pupil from iritis is known under the name of false cataract. - Being removed by absorption, as it sometimes is, and the sight improved, this also has been put down as cataract cured without operation.

There are cases, again, in which the lens may be really somewhat opaque or cataractous, but not sufficient in itself to interfere very materially with the sight, and in which, from congestion of the eye, the sight has become impaired. Now, treatment in such cases often has the effect of removing the congestion, and thereby improving the sight. This is then held up as an indubitable case of cataract cured without an operation, whereas the cataractous opacity of the lens remains undiminished and will go on slowly to increase as usual, and eventually obscure the sight in spite of all treatment.

There are other cases again in which there is an appearance of dimness of the lens, but not true cataractous dimness, though it is liable to be mistaken for such by medical men not much conversant with diseases of the eye. Along with this dimness in the pupil there is impaired sight, not from the dimness of the lens but from impaired sensibility of the retina. The sight in such cases being sometimes capable of more or less temporary improvement by treatment, such as counter-irritation, this improvement is held up

as an example of the cure of cataract without operation. In such cases, however, sight eventually becomes more and more impaired, or actually lost.

By a blow on the eye, the capsule of the lens is sometimes burst. The immediate effect of this is cataract, but gradually, by the solvent action of the aqueous humour, the opaque lens is dissolved, and eventually removed by absorption. The cataract is in this manner cured by the efforts of nature, not, however, without an operation, for the injury causing the capsule to burst was an operation—the same as that which surgeons call the operation of division. In short, the injury was at once both bane and antidote.

It is thus evident, that there is full scope for imposition in respect to the curability of cataract without operation, especially as there are so many people ready and willing to believe in it, and to believe even still more unfounded pretensions.

Mydriasis or simple fixed Dilatation of the Pupil.

The pupil is, in ordinary light, of its medium size, which is about one fifth of an inch in diameter. When the light to which the eye is exposed is strong, the pupil becomes contracted to a smaller size ; but, on the contrary, when the light is very dull, it is dilated to a larger size.

Dilatation of the pupil, persisting in opposition to the influences to which the pupil is ordinarily obedient, sometimes occurs, unaccompanied by any other defect of sight than may be accounted for by

such a derangement of the optical adjustment of the eye.

That the case is of this simple nature, and not one of that serious disease of the sight—amaurosis (of which dilatation of the pupil is a pretty common symptom), is ascertained if the patient, on looking through an aperture in a card of less than the ordinary size of the pupil, is able to see objects quite distinctly.

Not the less, however, should the patient take advice on his case, for the dilatation is apt to persist, and the sight become more impaired.

Myopy, or Short-sightedness, Presbyopy, or Far-sightedness, &c.

When the distance at which an ordinary sized type can be read *comfortably*, is much less than twelve inches, the vision is said to be myopic, or short; when, on the contrary, it is much greater, vision is said to be presbyopic, or long.

Preparatory to entering on an account of short-sightedness and far-sightedness, it will be useful to make some observations on refraction by convergent lenses, and on the adjustment of the eye to different distances.

Refraction by convergent lenses and the adjustment of the eye to different distances.

The rays of light from very distant objects, though not strictly parallel, are usually assumed to be so.

The focus to which such rays are brought by a convergent lens, is called the *principal focus of the lens*.

If rays do not come from such a distant body as to be parallel, but are more or less divergent, then the focus to which they are brought by the lens, is farther off from the lens than its principal focus, viz., at some point between this and infinite distance. This point is nearer the principal focus the more distant the body whence the rays emanated; in other words, the more nearly parallel they are, and *vice versâ*.

The point of an object from which any given pencil of divergent rays emanates, is named the focus of incident rays, and the focus to which these divergent incident rays are brought by the lens is named the focus of refracted rays. These two foci, the focus of incident rays, and the focus of refracted rays, in consequence of the relation between them above pointed out, viz., that when the one is near, the other is distant from the lens, are named *conjugate foci*.

From this it will be perceived, that if the refractive media of the eye were incapable of change, either as regards power, or as regards their relative position to the retina, the rays of light from objects at one particular distance only, would be collected into foci on the retina. Rays from objects farther from the eye than that distance would come to foci, before arriving at the retina, and having crossed, would fall in a scattered state on the retina, or, as it is called, in circles of dissipation. Rays from objects nearer would not come to foci, except behind the retina, on which therefore they would fall likewise in a scattered state (see figs. pp. 65 and 71).

The result of this would be, that objects could be seen perfectly distinctly only when situated at one particular distance from the eye. But we know that this is not the case. We know that we can see objects *perfectly* distinctly at different distances, within certain limits. Hence the eye must admit of adjustment to different distances, like our optical instruments.

Here the distinction is to be explained between perfect and distinct vision. In perfect vision, the outline, colour, and details of the object appear traced with the utmost accuracy, clearness, and strength; and this we have only when the rays of light are brought accurately to foci on the retina. In distinct vision, larger objects are seen so well, that they are readily recognised; the title-page of a book, for example, is easily read, but there is a want of clearness of outline and strength of tint, and small objects or the details of large objects are very imperfectly recognised; this is owing to the rays of light not falling on the retina in exact foci, but in small circles of dissipation.

The limits within which the eye can see perfectly distinctly at different distances, in other words, the limits of perfect vision, varies somewhat in different persons, and even in the two eyes of the same person; but in general they may be put down at between nine and fifteen inches. For some distance below nine, or above fifteen inches, the vision may be still distinct, but not perfect.

Though there can be no doubt that the eye is capable of adjustment for vision at different distances, the means by which this is effected have not been unequi-

vocally demonstrated; still, as the power of adjustment is lost with the crystalline body, it is very probable that it depends on a change in the position and form of the lens. By a very slight movement of the lens forward, and a very slight increase of its curvature, the eye could be adjusted for near distances, and *vice versâ*.

When the eye is adjusted for near objects, the pupil is contracted, and the axes of the eyeballs converged, and *vice versâ*; but these variations in the size of the pupil and direction of the eyeballs, are merely a concomitant and auxiliary, not an essential condition.

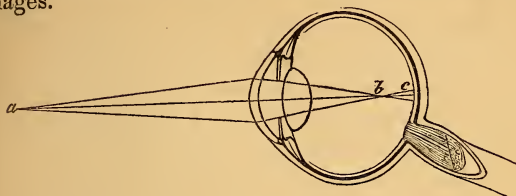
With a contracted pupil, or by looking through a small aperture, a presbyopic eye can see near objects, and a myopic eye, distant objects more distinctly. This is owing to the exclusion of the extreme circumferential rays of the cones of light which enter the eye, and the consequent diminution of the circles of dissipation on the retina.

Short-sightedness.

This is that state of vision in which the person can see objects perfectly distinctly only when they are at shorter distances from the eyes, than the average above stated.

It is owing either to too great power of the refractive media of the eye, or to the distance of the retina behind the crystalline being too great; so that in either case, the rays of light come to a focus before arriving at the retina, cross and are in a state of dissipation, when they do impinge on that nervous

membrane, and therefore form indistinct and confused images.



a, Focus of incident rays; *b*, focus of refracted rays falling in front of the retina; *c*, the rays impinging on the retina, in a scattered state.

By bringing the object near, it is distinctly seen, because the rays of light from it, which enter the eyes, being now more divergent than when it was distant, are not so soon brought to a focus; in other words, the different points of the object, as foci of incident rays, and the foci to which these rays are brought in the interior of the eye by the refractive media, are *conjugate foci*, and accordingly, when the foci of incident rays are brought nearer the refractive media, the foci of refracted rays recede from them.

Too great a refractive power of the media of the eye, may be owing either to too great convexity of their curvatures,—the curvatures of the cornea and crystalline,—or too great refractive density, or both conjointly.

The situation of the retina at too great a distance behind the crystalline body, may be owing either to a preternatural elongation of the axis of the eye-ball, or to the lens being nearer the cornea than usual.

In short-sightedness, the power of adjusting the eye to different distances, is still retained, but with-

in certain limits, thus, the nearest distance may be from two to four inches, the furthest, from six to twelve.

In many cases, there are no peculiar appearances presented by the eyes of myopic persons; but frequently the eyes are prominent and firm, the cornea very convex, the anterior chamber deep, and the pupil dilated.

Short-sighted people see small objects more distinctly than other people, because from their nearness the objects are viewed under a larger visual angle.

They see them also with a weaker light, because the objects being near, a greater quantity of rays from them arrive at the eye. Hence, they can read small print with a weak light.

But they can also see more distinctly, and somewhat further off by a strong light than by a weaker one, because the pupil is contracted by the strong light, and all but the more direct rays of light thereby excluded. On the same principle they see at some distance distinctly through a pinhole in a card; and when they try to view distant objects, they half close their eyelids. The rays of light in these cases have their divergence at the same time somewhat increased by diffraction.

They sometimes see objects beyond the limits of their distinct vision, double, or even multiplied.

Short-sightedness seldom occurs in so great a degree before puberty as to be troublesome; when in a great degree in children it may be a symptom of central cataract. After puberty, when the eyes come to be used in earnest, this defect of sight is usually first discovered to exist, and it may go on gradually increasing, especially if the person uses his eyes much

in reading, and on minute objects ; hence, the greater frequency of short-sightedness among the educated classes, and those whose occupation is with minute work. Myopy does not always diminish with years. We meet with persons of the most advanced age who still find it necessary to use glasses as deeply concave, as they did in youth, if not more so. Nay, short-sightedness sometimes occurs in old persons, whose vision was previously good for ordinary distances.

The true or optical short-sightedness under consideration, requires to be distinguished from that short-sightedness which depends on defective sensibility of the retina. In this latter form, which may be named *nervous short-sightedness*, although objects are seen better near at hand, they are not seen distinctly, as in true short-sightedness ; and help is obtained from convex instead of concave glasses.

In nervous short-sightedness near objects are, as above said, seen better, because more light being received into the eye from them, a stronger impression is made on the retina. On the same principle, convex glasses help the sight, and that for distant as well as near objects, by concentrating the light. On the same principle also, well illuminated objects are seen better.

An analogous form of short-sightedness is occasioned by impaired transparency of the lens.

To persons whose occupation is with minute objects, short-sightedness, unless in a very great degree, is rather an advantage, as they are enabled to observe all the details of their work very accurately ; and in the ordinary exercise of vision, the use of concave glasses is a ready and simple help.

When a tendency to short-sightedness manifests itself in youth, and especially if the future occupation of the person is to be of a kind requiring good vision for distant objects, much exertion of the eyes on minute work should be avoided, and the eyes frequently exercised on scenes in the open country.

Concave glasses help the vision of short-sighted persons for distant objects, simply by increasing the divergence of the rays of light before they enter the eye, so that they may be less speedily brought to foci than they would otherwise be, in consequence of the increased refractive power of the media of the eye; or, supposing the refractive power of the media of the eye not increased, but the distance of the retina behind the lens increased, that they may be brought to foci at a greater distance behind the lens than they would otherwise be, in order to correspond with the greater distance of the retina behind the lens.

Concave glasses are made of different degrees of concavity, the shallower being those adapted for the slighter degrees of short-sightedness, the more concave for the greater degrees.

When very short-sighted, a person requires to use concave glasses, not only to be enabled to see distant objects, but also for reading with, in order to avoid the necessity of stooping. For the latter purpose shallower glasses suffice. Less short-sighted people use glasses only to be enabled to see distant objects.

The focal length of the concave glass which a person will require to see objects at more than two or three hundred yards distance, should be about equal to the distance at which he can see to read distinctly

an ordinary type with the naked eye,—six inches for example.

The focal length of the concave glass which a very short-sighted person will require to see to read with at a convenient distance, is determined thus:—Suppose he sees to read with the naked eye at the distance of six inches, and desires to be able to read at the distance of twelve, the one distance is to be multiplied by the other, and the product seventy-two, divided by the difference between the two distances, viz., six. The quotient twelve, is the number of inches the focal length of the glass required should be.

But when a person finds it necessary to have recourse to glasses for short-sightedness, he should go to an optician, and select two or three pairs which appear to assist his vision best; or send for two or three pairs of about the focal length, which according to the above calculation he thinks will suit him, and try them leisurely at home for a day or two before fixing his choice on one particular pair.

The following are the circumstances which should guide him in his choice—

The glasses should be of the lowest power which will enable him to distinguish objects as he wishes, quite readily and clearly, and at the same time comfortably. If they should make objects appear small and very bright, and if in using them the person feel his eyes strained and fatigued, or if he becomes dizzy, and if after putting them aside the vision is very confused, they are not fit for his purpose—they are too concave.

Having once fitted himself, a person should not too

hastily change his glasses, although they may appear not to enable him to see quite so clearly as when he first began to use them.

A glass to each eye should always be employed ; vision is by this clearer, and its exercise less fatiguing than when a glass to one eye only is used. The use of a glass to one eye only is, in fact, very detrimental, especially to the opposite eye.

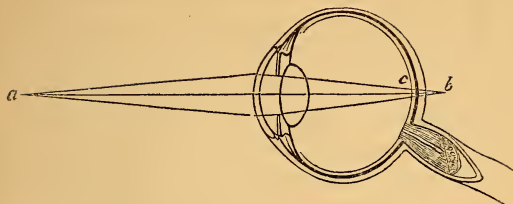
When, as is sometimes the case, the eyelids of short-sighted people are tender and irritable, the sight should not be much used in reading or sewing. In such cases, it is useful occasionally to bathe the eyebrows and temples with some cooling lotion.

Far-sightedness.

With this state of vision the person can see objects distinctly only when they are at a very considerable distance from the eyes ; in reading, for example, he holds the book at arm's length.

Far-sightedness being in almost all respects the converse of short-sightedness, the best way of discussing it here will be simply to reverse the account above given of short-sightedness, and which will therefore stand thus—

Far-sightedness is owing either to diminished power of the refractive media of the eyes, or to the distance of the retina behind the crystalline body being too short ; so that in either case the rays of light tend to come to a focus at a point behind the retina, on which therefore they impinge in a scattered state, and form indistinct and confused images.



a, Focus of incident rays ; *b*, focus of refracted rays falling behind the retina ; *c*, the rays in a scattered state, as they impinge on the retina.

By removing the object from the eyes, it comes to be distinctly seen, because the rays from it which enter the eye, being now less divergent than when it was near, are more quickly brought to a focus ; in other words, the different points of the object as foci of incident rays, and the foci to which these rays are brought by the refractive media are *conjugate foci* ; and accordingly, when the foci of incident rays are removed from the refractive media, the foci of refracted rays come nearer them.

Diminished refractive power of the media of the eye may be owing to diminution of the convexity of their curvatures, such as flattening of the cornea and crystalline. As to refractive density, there is probably an increase rather than a diminution of it, but this appears to be more than overbalanced by the diminution of curvature.

The situation of the retina too near the crystalline may be owing either to a preternatural shortening of the axis of the eyeball or a receding of the lens from the cornea.

In far-sightedness, the power of adjusting the eye to different distances is much weakened. In this respect far-sightedness differs from short-sightedness, in which the power of adjustment is still retained. In far-sightedness it may be said that the habitual adjustment of the eye is for distant objects, and that in trying to read, for example, the power of adjustment is exerted to the utmost, hence the fatigue and confusion of vision which soon ensue.

In many cases there is nothing peculiar to be observed in the eyes of far-sighted people; but frequently the eyes are sunk, the cornea flat, and of small diameter, and the pupil contracted.

Far-sighted people see small objects indistinctly at every distance, because when near, they are out of focus, and when removed from the eye somewhat, they are seen at a small visual angle and with little light. By increasing the light, they see better. Hence, they do not see so well by candle-light as before, and when attempting to read by candle-light, they place the candle perhaps between them and the book held at arm's length.

Large and distant objects they see very distinctly.

Far-sightedness seldom occurs except in persons who have passed middle age, and in them it is so common, that it is to be viewed as a natural change in the state of the eye. As it occurs in young persons, it will be spoken of under the head of *Asthenopy*.

Though instances have occurred of persons who have been long presbyopic, recovering their former vision, and thereby being enabled to lay aside the use of their spectacles, recovery from long-sightedness is

not to be calculated on, but this is of comparatively small moment, as vision can be so perfectly assisted by means of spectacles.

Something, however, may be done in the way of preserving the sight by avoiding over-exertion of the eyes in reading and other minute work, especially by artificial light, at the time of life when far-sightedness, with diminution of adjusting power, usually comes on.

As soon as the eyes begin to feel hot and fatigued, we should take warning, and give them rest, by looking off the work before us. A person, when he does find himself to have become far-sighted, and compelled to use spectacles, should still refrain as much as possible from exertion of his vision by artificial light.

Convex glasses help the vision of far-sighted people for near objects, by causing convergence of the rays of light before they enter the eye, so that they may be more speedily brought to foci than they would otherwise be, in consequence of the diminished refractive power of the eye; or, supposing the refractive power of the eye not diminished, but the distance of the retina behind the lens diminished, that they may be brought to foci at a less distance behind the lens, than they would otherwise be, in order to correspond with the diminished distance of the retina behind the lens.

Presbyopic persons, at the same time, that they have lost the power of adjustment for near objects, may be somewhat cataractous, or have their retina impaired in sensibility. In such cases, convex glasses,

besides remedying the defective adjustment, are of use by concentrating the light.

Convex glasses are made of different degrees of convexity. The least convex being those adapted for the slighter degrees of far-sightedness, the more convex for the greater degrees.

To see distant objects, far-sighted persons do not in general require convex glasses. It is most commonly to enable them to read and do minute work that they use spectacles.

If it is only at a *very great* distance that a person can see distinctly, the focal length of the convex glass which he will require to enable him to read will be equal to the distance at which he wishes to see to read.

If he is not so very far-sighted, but can see small objects distinctly at twenty inches distance, for example, the focal length of the convex glasses, which he will require to enable him to read at twelve inches distance, is determined by multiplying the two distances together, and dividing the product, 240, by the difference between them, viz., 8. The quotient 30, is the focal length in inches of the glasses required.

But when a person finds it necessary to have recourse to glasses for far-sightedness, he should go to an optician, and select two or three pairs which appear to assist his vision best, or send for two or three of about the focal length, which, according to the above calculation, he thinks will suit him, and try them leisurely at home for a day or two, before fixing his choice on one particular pair.

The following are the circumstances which should guide him in his choice :—The glasses should be of the lowest power which will enable him to see objects distinctly at the distance he wishes, and at the same time comfortably. Glasses which make the objects appear larger than natural, and strain and fatigue the eyes and cause headache, are not adapted to his case,—they are too convex. It is usually found that glasses the next degree more convex than those which suit by daylight, are required for work by artificial light.

The alteration in the eye on which the far-sightedness depends, generally goes on to increase with age, hence, it is necessary, after a time,—a few years,—to change the glasses first chosen for others more convex. In regard to this exchange it is to be observed, that it ought not to be too hastily had recourse to, nor, on the other hand, too long delayed. The same feeling of necessity which first prompted to the use of glasses, will indicate the necessity of change.

It is a not uncommon notion that glasses of certain focal lengths are adapted to certain ages, but this is erroneous. Still, though the choice of glasses cannot be determined by the mere age of the person, there is a certain average relation between the age and the focal length of the convex glass required, which may be expressed as follows :

Age in years . . .	40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 100
Focal length in in.	36, 30, 24, 20, 16, 14, 12, 10, 9, 8, 7.

Glasses of a low power are popularly called *preservers*, and are sometimes had recourse to without

any necessity, as if they possessed some specific quality preservative of the sight. The truth is, to good eyes they will prove not *preservers* but *depravers*.

Reading Glass.—This a double convex lens, broad enough to permit both eyes to see through it. It is used for the purpose of magnifying the object,—the names on maps, or the like,—whereas, convex spectacles are used merely to render objects distinct at a given distance, without magnifying them as above mentioned.

Cataract Glasses.

The difference in refractive power between the air and the cornea, being much greater than between the aqueous humour and crystalline body, the greatest amount of refraction which the rays of light undergo in the eye, in order that they may converge to foci on the retina, is that effected by the cornea on their first entrance. The crystalline body contributes comparatively little to the convergency. Hence, vision, after a successful operation for cataract, may be *tolerably distinct* for objects at a certain distance. Still, in order, that it may be *perfectly distinct*, the use of convex glasses is required.

But as with the loss of the crystalline body, there is loss of the faculty of the eye to adjust itself for different distances, except so far as variations in the size of the pupil contribute to this effect, glasses of different degrees of convexity are required according as the patient wishes to view near or distant objects. Thus, convex lenses of two and a half inches focus are generally required for reading, and lenses of

four and a half inches focus for viewing objects around him.

Of course before fixing on any particular powers, the patient will try which suit him best, and the test which should guide him in his choice is, that when the spectacles are put on, or, if hand-glasses, when they are held immediately before the eyes, he sees objects distinctly at the same distance as he saw them before he became blind.

Recourse is not to be had to the use of cataract glasses until the eyes have perfectly recovered from the operation, and have been so for some time,—say six months.

Cylindrical Eye.

Cases are met with in which the rays of light in entering the eye are refracted to a nearer focus in a vertical than in a horizontal plane. This would take place, if the cornea, instead of being a surface of revolution, in which the curvature of all its sections through the axis must be equal, were of some other form, in which the curvature in a vertical plane is greater than in a horizontal. This is, in fact, the natural form of the cornea, but in the instances referred to, existing, perhaps, in an exaggerated degree so as to disturb vision.

With such unnatural conformation of the eye, a point appears a line of a certain length; a circle an oval; every thing being seen elongated in one direction. The cylindrical deformation has been met with oblique, so that a square appeared a parallelogram.

The defect is remedied by glasses which, to the healthy eye, would make a line of the same length appear a point,—which would, in fact, shorten all objects in the same degree and in the same direction, as they are lengthened by the defective eye.*

Each case of cylindrical eye being thus more or less peculiar, lenses must be specially prepared for it; and it is evident that this demands both skill and intelligence on the part of the optician. The general principle on which the glass is shaped, Mr. Ross informs me, is this: one side of the lens is made a portion of a cylinder, of the same diameter as the cylinder cornea, having its axis, however, placed at right angles to that of the latter. The other side of the lens is made plane, convex, or concave, to suit the condition of the eye irrespective of its cylindricity.

Conical Cornea.

Defective sight sometimes occurs, in consequence of the cornea gradually becoming so prominent in the middle, as to be of a conical shape. Short-sightedness first attracts attention, and by and by vision becomes very indistinct at any distance. This is owing to the irregular refraction of the light. Deep concave glasses afford some assistance to vision; but only in the slighter degrees of the complaint.

Loss of power of adjustment.

The eye may fall into a state in which the vision is

* 'On the Use and Abuse of Spectacles,' by Andrew Ross, optician, London.

neither myopic nor presbyopic, and in which the power of accommodation being lost, convex glasses are required to see near objects, and concave glasses to see distant objects.

Chromatic or coloured Vision.

The coloured vision to be noticed here must be distinguished from that dependent on subjective excitement of the retina to be considered below.

Although the eye, strictly speaking, may not be perfectly achromatic, it is so in the healthy state to all intents and purposes; but in certain morbid states, its optical parts may become so suffused and deranged as to decompose the light, and make objects appear as if surrounded by the colours of the rainbow, thus:

1st. In catarrhal inflammation of the eye, films of mucus suffusing the cornea give rise to the appearance of iridescence around objects.

2d. When there is defective adjustment of the eye, and when, consequently, the rays of light do not fall in foci on the retina, vision, at the same time that it is thus rendered indistinct, and even multiplied, may appear slightly iridescent. Hence iridescence around objects is seen when the adjusting power of the eye is disturbed by passion, mental abstraction, sleepiness, the action of belladonna, mydriasis. Hence also, persons who have one eye myopic and the other presbyopic, often see colours when they look at very near or very distant objects with both eyes, because one eye only is adjusted to the distance of the object.

Diplopy or double vision, and Polyopy or manifold vision with one eye.

In consequence, probably, of the refractive media of the eye not having perfectly regular curves, double vision and manifold vision with one eye occur, as just mentioned, when the eye is not adjusted to the distance of the object looked at; hence short-sighted people see distant objects, and far-sighted people near objects, double or multiplied with one eye as well as iridescent.

But vision of one eye may be double or multiplied independently of defective power of adjustment to distance, in consequence of partial opacity of the cornea, or, more generally, partial opacity of the lens or its capsule. The action of these morbid states is well illustrated by Scheiner's experiment, which consists in looking at a pin, for example, through two pinholes in a card, placed so close to each other as to be included within a circle not exceeding the pupil in diameter. The pin appears double, except when held at a certain distance—that of perfect vision with the naked eye.

Asthenopy, or incapacity to keep the eyes fixed on near objects.

An incapacity to exercise vision on near objects, as in reading, sewing, and the like, for any length of time. The patient is able at first to see to read quite distinctly, but the vision soon grows confused. The

words appearing as if mixed together. The eyes, at the same time, become tired and painful—the pain extending to the head.

If the eyes are closed, and rest given to them for a few minutes, vision may be again exercised, but in a short time the eyes will become fatigued and the vision confused as before.

Vision for distant objects is not disturbed, and by the use of convex glasses the exercise of sight on near objects may be much assisted.

Asthenopy commences in childhood or youth, and may continue throughout life; but it is seldom met with originating in middle age.

The subjects of the affection often, but by no means always, labour under general nervous debility—the result sometimes of general disease.

There is often no evident cause. A very frequent cause is pure over-exertion of the eyes, as in students, artists, clerks, engravers, watchmakers, tailors, sempstresses, &c., especially by artificial light, together with want of sleep, want of exercise in the open air, and too early use of the eyes during convalescence after any severe illness. The complaint sometimes occurs as a consequence of inflammation of the eye, especially scrofulous, external and internal. Losses of blood, prolonged suckling, venereal indulgences, and the like, excite the affection, apparently by occasioning general nervous debility.

Asthenopy appears to consist in weakness of the apparatus by which the eye is adjusted for the vision of near objects. It is as if one were to hold a book too near. Though he might be able, by an effort, to ad-

just his eyes so as to see to read for a minute or two, the sight would then become confused and the eyes tired. The use of convex glasses would, however, prevent this. Along with the defective power of adjustment there is an irritable state of the retina, connected in some manner with tendency to internal congestion of the eyes.

Asthenopy is principally to be distinguished from presbyopy, night-blindness, and amblyopy, or incomplete amaurosis.

The prospect of complete cure is, on the whole, unfavorable, especially if the complaint is of long standing; less unfavorable provided what appears to be the exciting cause admits of removal. Asthenopy, though it has become confirmed, is not likely to end in blindness.

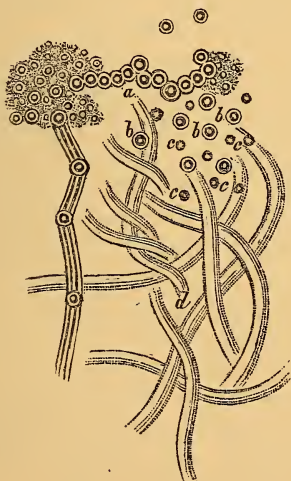
The first thing in the way of prevention and treatment is the avoidance, or removal by appropriate means, of any cause which may appear to be in operation, such as over-use of the eyes, and other causes above enumerated.

Rest to the eyes, the occasional application to them of cold water, good diet, exercise, country air, sea-bathing, and the like, must in general constitute a leading part of the treatment of asthenopy.

When the patient requires to employ his eyes on near objects, he has no other resource than to use convex glasses, which, in some cases, must be of the very lowest power only; but it would be advisable for the patient, if his occupation requires much use of the eyes, to change it if possible for one of an opposite kind.

Muscæ volitantes, or appearances like flies floating before the sight.

Muscæ volitantes are described by the patient who has made no particular examination of the appearance as blackish motes, or a thin gray film, like the wing of a fly, or semi-transparent gray threads, like spiders' web; but if viewed attentively against the clear sky, a white wall, or the like, they are recognised to be made up of some such appearances as are represented in the annexed figure.



According as the distance of the field against which the appearances are viewed is greater or less, they are seen larger and fainter, or smaller and more distinct.

Vision is not affected by floating muscæ. Between the several portions of the muscæ and by the side of them, the eye still sees with perfect distinctness. And after the muscæ have ascended out of the field of view everything is clear.

Floating muscæ are often detected suddenly, and thus are supposed to have just occurred. They are most observed when the patient looks at the clear sky, a thin cloud, snow on the ground, a white wall, or the like. They are indistinctly, if at all, noticed under the opposite circumstances of a dull light and looking at a dark object. They are not much seen when near objects are looked at.

They are generally observed to one or other side or above or below. The patient thus seeing them only by a side glance, finds it difficult to fix them in order to study their appearance. They move as the eye moves upwards and downwards, or from side to side; but besides this motion, which, as dependent on that of the eye, is merely apparent, the muscæ have a real motion of their own, and still more extensive than their apparent motion. Thus, if, from looking before him in a horizontal direction, the patient suddenly raises his eyes and fixes them on some object above the horizon, he observes that the muscæ fly upwards considerably beyond that degree of elevation, and even beyond the field of view, and then come sailing down before him till they disappear below.

Besides the motions of ascent and descent, the muscæ volitantes under consideration present lateral movements, although less marked, as well as changes in the relative position of their several parts.

Floating muscæ are to be distinguished from *fixed muscæ*, appearances which have no real motion, but apparent motion only depending on that of the eyeball. Fixed muscæ are owing to insensible spots of the retina.

Hitherto a very common opinion as to the nature of floating muscæ has been, that they are sensations, depending on some intrinsic change of state of the optic nervous apparatus, thus confounding them with fixed muscæ; but that they are truly sensations, occasioned by the presence of particles in the interior of the eye, and close in front of the retina, throwing their diffracted shadows on that nervous expansion, admits of demonstration.

But without entering minutely into the matter, the proposition may be easily illustrated thus: hold between a convex lens and the white surface on which the image of the light falls, some small object, as a pin. When this is near the lens, its shadow is not seen on the white ground, but when it is brought nearer and nearer the white surface, its shadow appears more and more distinctly.

The particles, moreover, appear to be of natural occurrence in the eye, for the appearance of floating muscæ may in general be seen by any person on simply looking through a small aperture in a card at the clear sky, or through the eyeglass of a compound microscope at the flame of a candle two or three feet distant, or simply by nearly closing the eyelids, and looking at a lighted candle.

Muscæ volitantes are often seen by persons without any particular notice of them being taken, as they

are indistinct, present themselves occasionally only, and are therefore not troublesome. They are seen most distinctly, and are therefore most troublesome, when there exists an irritable state of the retina. Such a state of the retina may therefore be viewed as the general condition on which floating *muscæ*, considered as a disease, depend.

Dilution of the images of external objects favours—distinctness, on the contrary, prevents—the perception of *muscæ*. Hence, when the person is short or far-sighted, they appear less evident to him when he uses the glasses fitted to render his vision distinct.

As exciting causes of the complaint, may be mentioned—over-use of the eyes on minute objects; inflammatory diseases of the eyes, external as well as internal; the seeking for them in experiments; intemperance; febrile diseases; influenza; disease of the heart; want of sleep; dyspepsia; abdominal congestion; hysteria; hypochondriasis; morbid sensibility of the system generally, arising from pressure of business, anxiety, and distress of mind. All these causes appear to operate in the same manner, occasioning a congested state of the eyes.

When a hypochondriacal person once detects *muscæ volitantes*, he takes such frequent notice of them, that they become to him more and more troublesome.

From what has been said, it will be seen that the occurrence of floating *muscæ* is of itself no indication that either cataract or amaurosis is taking place. If, however, there be along with the appearance of *muscæ* a failure of vision, and if that failure be not attributable to myopy or presbyopy, which may be ascer-

tained by a concave or a convex glass not improving vision, then cataract or impaired sensibility of the retina may possibly exist.

In uncomplicated cases, the muscæ may indeed increase in numbers, but very slowly, and never to such an extent as to interfere with the distinctness of vision in any very serious degree. But very often the muscæ remain stationary, or even become less.

As they depend on the vision of objects naturally existing in the eye, and are distinctly observed only in consequence of a morbid sensibility of the retina, whatever tends to promote or relieve this will have the effect of promoting or relieving the muscæ.

The removal or abatement of the exciting cause, if it can be detected, is the first thing to be looked to in the treatment. Rest to the eyes, if they have been overstrained, relaxation from business, quiet to the mind, regulated diet and exercise, with change of air, are to be recommended. Bathing of the eyes with cold water two or three times daily, for five or ten minutes, is the most important local application.

CHAPTER II.

AMAUROTIC AFFECTIONS, OR DEFECTS OF SIGHT DEPENDING ON PERVERTED, IMPAIRED, OR LOST SENSIBILITY OF THE OPTIC NERVOUS APPARATUS.

Abnormal excitement of Visual Sensations.

IN amaurotic affections, various visual sensations, though not in themselves unnatural, are apt to be excited unnaturally. Such sensations being important as symptoms, it is necessary to study them; but, previously to doing so, the circumstances attending their natural occurrence must in each case be taken into consideration.

Photopsy and Chroopsy, or sensations of light and colour, independent of external light, excited by internal influences operating on the optic nervous apparatus.

In the unexcited condition of the optic nervous apparatus, there is darkness before the eyes, but in the excited condition, light and colour are seen.

The agent by which the optic nervous apparatus is usually excited is the principle of light; but an excited condition, and consequently the sensations of light and colour, may be called forth by other in-

fluences, such, for example, as pressure. And it is to be observed, that whatever may be the stimulus which excites the optic nervous apparatus, no other sensations but light and colour can be called forth in it.

It is indifferent what part of the optic nervous apparatus be excited in order that luminous sensations may be perceived—whether the retina itself be irritated, the fibres of the optic nerve in the orbit irritated or cut, or whether the cerebral part of the optic nervous apparatus be pressed on by congestion or tumour. Moreover, in whatever part the optic nervous apparatus be excited, the luminous sensation which results is always referred by the sensorium to the surface; not only to the surface, however, but as in natural vision, to without the body—(*projection outwards*). See pp. 11 and 12.

A familiar example of a luminous spectrum of the kind under consideration is that which, on pressing the eyeball, is seen projected outwards, and on the side opposite to that where the pressure is applied.

Other examples are—a spectrum of the vessels of the retina, *light on a dark ground*, which, in certain states of the eye, is seen, and which is owing to pressure on the retina by its vessels in a state of congestion; the appearance of a shower of lucid globules before the eyes on suddenly rising from a stooping posture, from the disturbance in the circulation in the optic nervous apparatus thereby occasioned.

Analogous appearances of fiery sparks, flashes of light, and coloured corruscations, occurring spontaneously, are symptoms of irritation or excitement of some part of the optic nervous apparatus, cerebral

or ocular, from inflammatory congestion. As such inflammatory congestion may end in amaurosis, so the luminous and coloured spectra are symptoms of incipient amaurosis. They may continue to appear, however, after all visual sensibility is lost.

Sensations of colour of the kind just considered are to be distinguished, on the one hand, from those which depend on an optical derangement in the eye itself, whereby its achromatism is destroyed, and on the other, from accidental or complementary colours, to be considered below.

Spectra consequent to impressions on the Retina and complementary colours.

In the natural state, the sensations of the retina remain a short space of time after the impression which occasioned them has ceased to act. Hence, an image of an object may continue to be seen for some seconds after the eyes have been turned away from looking at it. This phenomenon is, in general, most readily observed in twilight; in daylight, the impression of the object on the retina requires to have acted more intensely and a longer time to produce the effect.

The spectrum appears when the eyes are directed to the sky, projected in the distance and of gigantic size.

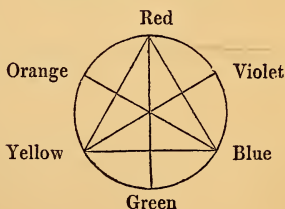
The spectrum is seen differently, according as the eyes, when turned away from the object, are darkened or directed to an illuminated surface. In the former case, the lights and shadows are the same as appeared

at the time of regarding the object; in the latter, they are the reverse.

If the object from which the impression has been derived is coloured, the spectrum is coloured also, but differently, thus:—If the eye be fixed on a red-coloured object for some time, and then turned away from it, a spectrum of the object will continue to be seen, but instead of a red, of a green colour. If, on the contrary, the object looked at be green, the spectrum will be red; again, if blue, the spectrum will be orange; if orange, the spectrum will be blue; if yellow, the spectrum will be violet; if violet, the spectrum will be yellow.

From this it is seen that the colour of the spectrum is always that which, being added to the colour of the object looked at, makes up the sum of the three prismatic colours, yellow, red, and blue, which, by their combination, form white light; hence the name *complementary* which has been given to the colour of the spectrum.

In the annexed figure the primitive colours, yellow, red, and blue, are placed at the angles of the triangle, the compound colours, orange, violet, and green, at the intermediate points. The primitive colour and the compound one, which thus stand opposed, viz., yellow and violet, red and green, blue and orange, are complementary of each other.



A spectrum is very readily produced by looking at the setting sun. If on turning the eyes away they are darkened, the colour of the spectrum is at first luminous white ; it then changes to yellow, and from that runs through the different colours of orange, red, violet, blue to black, when the spectrum ceases. If, on the contrary, the eyes are directed to a white surface, the spectrum is at first black, then blue, which colour is succeeded by violet, red, orange, yellow, until the spectrum, becoming white, is no longer distinguished.

In certain morbid states of the retina, even although vision be much impaired, the sensation remains after the impression a much longer time than natural ; hence arise illusions of vision from the spectrum and complementary colours. In such a case, for example, if the person, after his eye has rested on some small and near object, the tassel of a blind for example, should accidentally look towards the sky, he will see a magnified image of it ; but not aware of the cause, he is astonished by what appears to him a gigantic human figure in the air.

In illustration of the excitement of the sensation of light by other agencies besides the agent properly called light, and how apt people are to mistake the former for the latter, the following case is adduced :

Some years ago, in Germany, a clergyman was assaulted one dark night by two men, one of whom struck him on the right eye with a stone. By the light which streamed from his eye, in consequence of the blow, the clergyman averred that he was enabled

to see and identify the man who committed the outrage.

The question whether this was possible was actually raised in the criminal investigation, and the official district physician was referred to for his opinion. This gentleman, without fully admitting the possibility of what the clergyman maintained, still thought that there was some probability in it.

Professor Müller, the distinguished physiologist of Berlin, who has well commented on this singular case, sarcastically but justly observes, that if the district physician had pressed on his own eye in the dark, and tried to read by the light thereby emitted, he would probably have come to a more decided conclusion.

The alleged identification of a man in the dark by light struck from the eyes by a blow, is only paralleled by the celebrated exploit we read of in the adventures of the redoubtable Baron Munchausen. In an encounter with a wild beast, the German baron, to his dismay, found that the flint of his gun had dropped out. Fertile in expedient, however, our hero tells us, that he immediately gave his eye a blow, and thus struck fire from it sufficient to ignite the priming and discharge his gun, laying the animal dead at his feet!!!

Though the changes operating on the brain, whereby we are rendered conscious of sensations, are usually the result of the communication of impressions on the nerves of sense made by external agents, such changes in the state of the brain may be the result of the communication of changes in the

state of the nerves of sense induced by impressions made by some agency operating within them, or they may be primarily induced by some cause directly operating within the brain itself, as appears to have occurred in the following case—

A woman, deaf for some years, and troubled with noises in her head, became subject to photopsy also; and fell into the hallucination of supposing that people had everywhere conspired to annoy her, by throwing glares of light into her eyes. I found it impossible to convince her of the real nature of her complaint. Her intellect was evidently impaired, from the same disease of the brain to which the noises in the head and the photopsy were owing.

Phantasms.

Besides the subjective sensations now spoken of, and which are owing to the communication to the brain of a change of state of the nerves of the senses concerned, induced by a cause operating within them, there is another class of subjective sensations which have their origin in the reaction of the mind on the senses. To this class belong *phantasms*.

Phantasms of touch are exemplified in the pains of hypochondriacs. In regard to phantasms of hearing, people sometimes imagine that they hear not only sounds, but spoken words. The phantasms of vision are those, however, which have attracted most interest. Appearances as if of various objects—landscapes and figures, for example—even walking figures—present themselves before the eyes. Nay,

phantasms of both hearing and vision may occur together—the human figures seen, being, at the same time, heard talking. In the celebrated case of Nicolai, the Berlin bookseller, the phantasms were, at first, *seen only*, but after a time, they were *heard also*.

Phantasms are of most common occurrence in disease, under the influence of opium and other narcotics, in drunkard's delirium, and in insanity; but they may appear to persons otherwise healthy, though in an excited state either from original temperament, or in consequence of being placed in exciting circumstances. And of course, exciting circumstances will operate more strongly on a person already excitable from original temperament.

The mental state excited by some strong impression, or by long brooding on a cherished scheme, may, by its reaction on the senses, give rise to a vivid production of phantasms relating to the predominating idea.

This is exemplified by Shakespeare, when he makes Macbeth exclaim :

“Is this a dagger which I see before me,
The handle toward my hand? Come, let me clutch thee:
I have thee not, and yet I see thee still.”

We have a similar example in Brutus—“midst his slumbering host, startled by Cæsar's stalwart ghost.”

Phantasms occurring in persons of strong mind and cultivated intellect are recognised as such. This was the case with Nicolai, already referred to. The arguments used by the epicurean Crassus, to tranquillise the mind of his friend Brutus, after being

startled by the apparition of Cæsar, showed that he took a correct view of the matter, attributing the phenomenon solely to the imagination; and Shakespeare makes Macbeth raise the question, when he adds to his first exclamation :

“ Art thou not, fatal vision, sensible
To feeling, as to sight ? Or, art thou but
A dagger of the mind ; a false creation,
Proceeding from the heat-oppressed brain ? ”

In the case of persons of uncultivated intellect, phantasms have, no doubt, been the origin of many ghost stories. Whilst in persons of weak intellect, not otherwise actually insane, they may lead to hallucinations prompting to insane actions.

Every one has heard of the phantasms excited by the use of opium, and the still more remarkable ones excited by Hashish, or Indian hemp—the drug said to have been used by the sect of Assassins, under the blow of one of whom, Conrad, Marquis of Montferrat, one of the leaders of the Crusaders, fell, to raise phantasms, and thereby excite themselves to their violent deeds—hence the name Assassin.

The occurrence of phantasms in insanity has been mentioned, but it would be out of place here further to refer to them.

I come, in the last place, to notice the phantasms on which has been founded a belief in “second sight.”

That kind of second sight referred to by Campbell, in the following lines :

“ ’Tis the sunset of life gives me mystical lore,
When coming events cast their shadow before.”

is, after all, a natural enough kind of second sight, and one which we all acquire more or less by the experience of life.

Persons said to have been endowed with "second sight" among the Scotch Highlanders, appear to have been of excitable temperament and deeply contemplative character. Alan Macaulay, in Sir W. Scott's 'Legend of Montrose,' is a good example. Such a person, having his mind intently and anxiously fixed on some stirring enterprise, may readily be supposed, when wrought up to a paroxysm of excitement, to have had presented to his mind's eye, and with all the distinctness of reality, a possible combination of events. In any case, when the events turned out in the combination predicted by the seer, the vision was received as supernatural, and the case was treasured up in the memory of those concerned. But when the events did not correspond to the prediction, the failure, as generally happens in unsuccessful cases, was unnoticed and forgotten.

Impairment and loss of sensibility of the Optic Nervous Apparatus, or Amaurosis in its various degrees.

The sensibility of the retina is greatest in the middle; from thence it diminishes towards the circumference.

In consequence of this, we see only that part of an object very distinctly to which the axes of the eyes are at the moment directed. In examining an object, therefore, the axes of the eyes are so moved, that the central

region of the retina may be successively impressed by the image of its different parts.

The difference in the degree of sensibility of the middle and circumferential parts of the retina may be illustrated by a reference to the difference in the degree of sensibility of the skin of the lips for example, and the skin of the cheeks. Whilst the points of the two legs of a pair of compasses, when separated a very short distance from each other, are applied to the skin of the lips, the mind distinguishes the two impressions; but when applied to the skin of the cheek, there is no distinct perception of two points, but a sensation as if one impression only were made.

As impressions on the less sensitive skin of the cheek are perceived, as if smaller than impressions on the more sensitive skin of the lips; so objects seen by the less sensitive circumferential part of the retina appear smaller than when seen by the more sensitive middle part; or, *ceteris paribus*, an imperfectly illuminated object appears smaller than one brightly illuminated. In like manner, when the sensibility of the retina is impaired, objects appear smaller than natural.

Daltonism, or defective perception of Colour.

Numerous cases are recorded, in which persons were unable, in different degrees, to distinguish certain colours, their sight in other respects being unimpaired. Mr. Dalton, the late celebrated chemical philosopher, who was so affected, wrote on the subject; hence the name, *Daltonism*.

The colours most generally confounded were, red and brown with green, and pink with blue. Yellow and blue were the colours most readily recognised.

The affection appears to have been, in most cases, congenital, and incurable.

Transitory Hemiopy, or Half-vision.

The following is an account of hemiopy, by Dr. Wollaston, as it occurred in his own person: "I suddenly found, after violent exercise, two or three hours before, that I could see but half the face of a man whom I met; and it was the same with respect to every object I looked at. In attempting to read the name JOHNSON over a door, I saw only SON; the commencement of the name being wholly obliterated to my view. The loss of sight was towards my left, and was the same, whether I looked with the right eye or the left. This blindness was not so complete as to amount to absolute darkness, but was a shaded darkness, without definite outline. The complaint was of short duration, and in about a quarter of an hour might be said to be wholly gone, having receded with a gradual motion from the centre of vision obliquely upwards towards the left."

More than twenty years subsequently, a similar attack occurred again, without Dr. Wollaston being able to assign any cause whatever, or to connect it with any previous or subsequent indisposition. "The blindness," says he, "was first observed, as before, on looking at the face of a person I met, whose *left* eye was to my sight obliterated. My blindness was in

this instance the reverse of the former, being to *my right* (instead of the left) of the spot to which my eyes were directed ; so that I have no reason to suppose it in any manner connected with the former affection. . . . On this occasion the affection, after having lasted with little alteration for about twenty minutes, was removed suddenly and entirely by the excitement of agreeable news respecting the safe arrival of a friend from a very hazardous enterprise."

In some persons, the affection is of frequent occurrence, coming on along with indigestion, headache, and nausea, but going off in a few hours.

According as hemiopy depends simply on fatigue or gastric derangement, so must the treatment be regulated and the means adopted to prevent its recurrence.

Night Blindness.

Indistinct vision, recurring regularly at night, is sometimes met with as a congenital and habitual infirmity ; there are instances of its having prevailed as an epidemic. Most frequently it is met with as an occasional complaint, especially in warm countries and warm latitudes at sea.

In the beginning of the complaint the patient is still able to see objects a short time after sunset, and perhaps to see a little by clear moonlight, and he can see distinctly by bright candlelight. Vision, however, becomes more and more imperfect at night, so that, after a few days, the patient can no longer discriminate

the largest objects after sunset or by moonlight, &c. ; and, after a longer lapse of time, he ceases to see any object distinctly by the brightest candlelight.

The principal causes of night-blindness appear to be fatigue and exposure to the strong light of the sun and gastric derangement ; lunar influence is also considered to operate as a cause. I have met with two cases apparently arising from exposure of the eyes to naphtha vapour.

Congenital night-blindness sometimes affects more than one member of the same family. A most remarkable history of night-blindness, hereditary in one family for two centuries, has been recorded.

Under proper treatment, the prognosis, in cases of the occasional form of the complaint, may be always favorable. The duration of the disease is generally from two weeks to three or six months. If, however, it be neglected or mistreated, vision may become imperfect in the daytime as well as at night.

Europeans who have been once affected with night-blindness are particularly liable to a recurrence of the complaint as long as they remain in tropical climates.

Fixed Muscæ.

These appearances never change their position, either in regard to each other or to the optic axis.

Fixed muscæ vary in number, size, and form. At first semi-transparent, they afterwards become black, or at least dark. They appear in reading like blotches on the paper ; but when the eyes are directed to a

distant object, they appear so large that they cover it perhaps. Fixed muscæ are most distinct in the light; in darkness they are either not seen, or seen as luminous appearances. If confined to one eye, they are most distinct when the other eye is closed.

Fixed muscæ are owing to insensible spots of the retina. The centre of the retina is sometimes the part affected, and the appearance seen is that of a dark spot in the middle of the field of vision. Thus the flame of a candle is, perhaps, invisible, whilst the light halo around is seen.

Muscæ may change in form, size, and darkness. And though any given musca may not alter its position, it may disappear, whilst others may present themselves in another part of the field.

The insensible spots of the retina on which the appearance of fixed muscæ depends, constitute partial amaurosis; this may pass into total amaurosis, the insensible spots gradually increasing in size until objects are no longer seen.

Fixed muscæ are often merely a symptom of evident posterior internal inflammation of the eye.

*Amaurosis.**

Amaurosis is impairment or loss of vision from disease of the retina, optic nerve, or part of the brain with which the optic nerve is connected.

Amaurosis is said to be *incomplete* or *complete*,

* Gutta serena of the Arabians, in contradistinction to *gutta opaca*, the name they gave to cataract.

according as the sensibility for visual impressions is impaired merely, or quite lost; and *partial* or *total* according as the defect of sight extends to a part only, or the whole field of view.

In incomplete amaurosis, the patient's field of vision is obscured as if a gauze or cloud were interposed between him and the objects looked at.

In partial amaurosis, the obscurity may involve the centre or the circumference of the field, or some one side only; or it may be limited to a mere spot, or to several spots dispersed throughout the field. Objects are thus seen or not, according to the part of the field of view in which they are situated; or if large enough to occupy the whole field, their circumferential or central part only is seen, or one half only, or a part here and there. When the insensibility is limited to a spot or spots merely, the appearance of fixed muscæ is occasioned.

Vision is often better one day, worse another; sometimes better in the morning, sometimes in the evening; sometimes better after meals, sometimes worse.

The amaurotic person generally sees an object indistinctly, until such time as he has steadily fixed his eyes on it. Sometimes, however, by moving the object before him, he sees it better than when at rest.

Objects sometimes appear smaller.

The patient usually sees better in strong light, but in some cases, better in dull light. Sometimes he is intolerant of light, even when the blindness is complete.

In some cases the patient sees distant objects

better than near; in other cases again, near objects better than distant.

Photopsy, chroopsy, and the undue retention of impressions, giving rise to ocular spectra and complementary colours, are frequent attendants on amaurosis. The gauze or network seen in the light may still be visible in the dark; but instead of being gray or black, it is of a silvery or gold colour.

The pupil is more or less dilated, and if not quite immovable, its movements are limited and slow. This, although one of the most characteristic appearances presented by the amaurotic eye, is not constant.

The invasion of the amaurosis may be sudden or gradual. In the former case, vision may be at once wholly lost, or nearly so; in the latter case, it may be only after a time that the vision is seriously impaired. In some cases, the impairment of vision remains at a certain stage without advancing, in other cases it continues to increase, the obscurity thickening and spreading, until the whole field of vision is obliterated to the sense, the perception of light lost, and the amaurosis complete. Sometimes amaurosis commences as night blindness.

Except when the case is of a purely local nature, both eyes generally become affected; one eye first, perhaps; and by-and-bye the other. The blindness being complete and total in one eye, some degree of sight may still be retained in the other.

The diseases the previous existence of which is often found to have some connection with the amaurosis, either as cause, or as depending themselves on

the same cause, are, scrofula, syphilis, gout, rheumatism, indigestion, hypochondriasis, hysterics, apoplexy, epilepsy, paralysis, inflammation of the brain, typhus fever, lead poisoning, &c.

In some cases the disease is found to occur in connection with disturbed menstruation, hysterics, pregnancy, child-bed, hemorrhoids, and again to disappear entirely, but to recur, and then perhaps to remain permanently.

The paralysis of the optic nervous apparatus, on which amaurosis depends, may be the result of morbid conditions of that apparatus, differing much in their nature:—

They may be congestion or inflammation, and its consequences; nervous exhaustion; super-excitation; or pressure. And the retina, or the optic nerve, or the cerebral portion of the optic nervous apparatus, may be more particularly the part affected.

The causes to which congestive amaurosis is owing are very various. Exposure of the eyes to strong heat and light in those who work before large fires, &c. Over-exertion of the sight. Forced exertions of the body while stooping the head, especially in plethoric or drunken persons. Pregnancy. Sudden suppression of discharges—the menstrual, perspiratory, hemorrhoidal, purulent, &c. Irritation of the liver, stomach, and bowels, as in indigestion, costiveness, or worms. Passions of the mind. Fevers. Spirit-drinking. Excessive use of tobacco, &c.

Exhaustion of the optic nervous apparatus is often

a mere accompaniment of general nervous exhaustion, arising from great loss of blood, or excessive discharge of secretions, as in protracted suckling, venereal excesses, or arising from grief and other depressing passions—from low nervous fevers, fright, &c.

The cases of amaurosis which arise from super-excitation occasioned by sudden strong impressions on the retina, such as an intense glare of light falling on the eye, concussion of the eyeball, or a stroke of lightning, and also those arising from overplying vision, appear to partake of the nature partly of nervous exhaustion, and partly of congestion. For example, the spot of the retina acted on by a sudden glare of light, or by smart concussion from a blow, is at once rendered insensible, and the result is a fixed musca, which may ultimately go away or remain; or the whole retina may become insensible, though this more generally takes place slowly, as a consequence of supervening congestion or inflammation.

Of the cases depending on pressure, the amaurosis is, in some, but a secondary consideration, more grave symptoms of the organic disease being present; in other cases the amaurosis may be the only or principal appreciable symptom.

The prognosis in a decided case of amaurosis is most unfavorable. The disease, when it comes on suddenly, even when complete blindness is present, is not unfrequently relieved or cured, if it has not already existed long. The disease which has come on

gradually, accompanied by pains in the head, is more hopeless in general, as in this case the cause most usually is material disorganization of some part of the optic nervous apparatus; whereas, sudden cases may be owing to some congestion, extravasation of blood, or the like, admitting of removal by timely treatment.

CHAPTER III.

DEFECTS OF SIGHT DEPENDING ON LOSS OF CORRESPONDENCE OF THE SENSATIONS AND MOVEMENTS OF THE TWO EYES.

As an introduction to the present subject, the correspondence which naturally exists between the sensations and movements of the two eyes, requires to be taken into consideration.

Single Vision with two Eyes.

As the rays of light, emanating or reflected from the different points of a visible object, proceed in all directions, and in straight lines, those from the same points must necessarily, some of them, enter the one eye, and some the other, and so impress both retinae in the same manner, and at the same time. From this double impression, it is to be observed, we have not a double perception of the object, but only a single one, provided the eyes be naturally directed, that is, provided their optic axes intersect at some point of the object, provided their centres of revolution coincide, and provided their horizontal and vertical diameters are respectively parallel.

When the two eyes are thus naturally directed, the

parts of the two retinae which receive similar and simultaneous impressions from the rays of light entering them from a given point of the object, are their vertices, and their various parts equally situated in relation to them, on the half of one retina next the temple, and on the half of the other next the nose. These parts of the two retinae, as similar and simultaneous impressions on them yield but a single visual perception, are called *corresponding or identical parts*.

If the two eyes are not directed in the manner above described, the rays of light from given points of the object will not then fall on corresponding parts of the two retinae, and the consequence will be that the two impressions will be perceived by the mind separately, and the object will be seen double.

Amidst the various movements of the eyeballs, the correspondence in their direction necessary for single vision is maintained by the concurrent action of their muscles. (p. 13.)

*Visual perception of the three dimensions of space,
Length, Breadth, and Thickness.*

By the combined action of the two eyes we are enabled to perceive at one glance the length, breadth, and thickness of objects. This is owing to the position of the two eyes in the head, by which each is fitted to receive on its retina a different perspective picture of the object in a manner analogous to that in which, with two fingers, we can receive impressions from

two sides of a solid body, so that we recognise its thickness as well as its length and breadth, whilst the mind, in conformity with an original connate law of the economy, does not perceive two superposed dissimilar images, but only a single one, and that, unlike either of the perspectives, in full relief or intaglio, as the case may be.

The stereoscope shows this.

The stereoscope, it may here be observed, also shows how vain it is for a painter to attempt to represent objects in full relief or intaglio, as seen with the two eyes. All that can be really and naturally represented by painting, on a plain surface, is merely the *appearance* of relief or intaglio as seen when one eye only is used. This explains why it is that, in looking at pictures, we see them to greater advantage when one eye is closed; in fact, when we use both eyes, the appearance of relief, even as perceptible to one eye, is in a great measure destroyed.

The faculty of perceiving the three dimensions of spaces by the two eyes, implies the faculty of recognising the distance and position of near objects by the same means.

Diplopy or double vision with two Eyes.

It is to be observed that double vision with two eyes is altogether different in its nature from the double or manifold vision with a single eye above considered, the latter being owing to irregular refraction. A case of double vision with two eyes is at

once distinguished by closing one eye, when objects will be seen single.

Double vision with two eyes is the result of loss of the natural correspondence of the optic axes, the coincidence of the centres of revolution, and the parallelism of the vertical and horizontal diameters of the two eyes, the conditions on which, as above shown, single vision depends. The immediate cause of the derangement alluded to is, most frequently, paralysis of some one or more of the muscles of the eyeball ; but it may be some morbid production in the orbit, or the like, displacing the eyeball.

The relative position of the two images seen in double vision depends upon the direction and degree of the deviation of the eyes.

As sometimes the deviation of the axes or centres and diameters of the eyes exists only when the person looks in particular directions and at certain distances, so does the double vision in such cases take place only when the patient looks in those directions, and at those distances.

When double vision is owing to deviation of the optic axes, the misdirection of the two eyes may exist in various degrees, from an evident squint to a scarcely perceptible cast.

When, on the contrary, double vision is owing to deviation of the vertical and horizontal diameters of the two eyeballs from parallelism, in consequence of abnormal action of one of the oblique muscles, there is no deviation of the optic axes, and, consequently, no squint or cast.

The irregular or impeded action of the muscles of

the eyeball, giving rise to diplopy, may be owing to an affection of the muscles themselves or of their nerves, or it may be owing to disease or injury of the brain, or to drunkenness, or fear, or to derangement of the stomach, &c.

Strabismus or squinting, and luscitas or immovable distortion of the Eyeballs.

Strabismus and luscitas are equally characterised by loss of the natural correspondence of the optic axes; but, in the former, this is owing to want of harmony in the movements of the eyes, not to loss of motive power, for the squinting eye becomes straight and capable of being directed to any object when the other eye is closed; whilst, in the latter, it is owing to one eye being fixed more or less immovably in one direction, in consequence either of paralysis of the muscle moving the eyeball in the opposite direction, or of induration and shortening of the muscle, or the like, on the side to which the eyeball is turned.

The principal forms of strabismus or squint are the *convergent* or *inward*, and the *divergent* or *outward*; and of these the former is by far the most common.

The exciting causes to which strabismus is in different cases attributed, or attributable, are very various. They are such as the following:—Convulsions during infancy, difficult teething, whooping-cough, measles, smallpox, worms, injuries and diseases of the head, fright, anger, injuries, inflammation, and other diseases of the eyes, such as opacities of the

cornea, imitation, and a habit of misdirecting the eyes.

Most commonly, squinting has its origin in early life; indeed, many of the diseases just enumerated as exciting causes of the affection are diseases of early life.

Frequently, no cause at all can be assigned.

In most cases the vision of the squinting eye is imperfect.

Whatever be the remote cause of strabismus, there can be no doubt that its proximate cause consists in some affection of the muscles of the eyeball. The question which this conclusion naturally suggests is, what is the nature of the affection of the muscles of the eyeball?

The various exciting causes of strabismus which have been remarked, such as imitation, affections of the mind—anger, fear, &c.,—disease of the brain, intestinal canal, and other parts, together with the circumstance that it may occur occasionally only, and the phenomena of the distortion in general, all point to the muscular affection being owing to perverted nervous action.

When convergent squint is of recent origin, and if its exciting cause can be discovered, and is still in operation, the removal of it ought to be the first object of treatment.

It is scarcely necessary to say, that whatever prompts to a habit of misdirecting the eyes, whether imitation, trying to look at objects too near the eyes or otherwise disadvantageously placed, careless employment of the sight, and the like, must be carefully guarded against.

Exercise of the habitually misdirected eye during two or three hours daily, by covering the other eye, has often been found successful in curing squint. But it is apt to happen that, whilst the habitually misdirected eye becomes straight, the previously well-directed one turns in.

When convergent squint has become fully established it resists, as is well known, all treatment such as that above indicated, and no other help remains but the operation.

Operation.—This consists in division of the affected muscle, is very simple in the performance, and not accompanied by much pain.

Section of the internal straight muscle of the habitually misdirected eye alone may be sufficient, but section of the internal straight muscle of both eyes is generally necessary, as it is found that, if one eye only is operated on, it either still remains inverted, or, if it is rendered straight, the previously well-directed eye is apt to turn in.

The latter circumstance is analogous to that above pointed out, viz., that when the previously well-directed eye is covered, and the habitually inverted one, by being thus called into exercise, becomes straight, the former turns in.

In general, little treatment is required after the operation. It is, however, always advisable to keep the patient at rest for some days. The eyes should be bathed with luke-warm water night and morning.

Should a return of the squint take place, the operation may be repeated. Sometimes success has

been obtained only after a second or third repetition.

Paralysis of the muscles of the Eyeball and Eyelids.

It sometimes happens that a person is seized with inability to open one eye. When, in such a case, the upper eyelid is raised with the finger, it will perhaps be seen that the patient, though he can turn his eye towards the temple, cannot look inwards, upwards, nor downwards. If he attempts to look forward or to the unaffected side, the patient sees objects double, in consequence of the non-correspondence of the two eyes, and he is apt to become giddy if he tries to walk while he holds the eye open.

In addition to the defects in the moving power of the eyelids and eyeball just described, there may be persistent dilatation of the pupil, with impairment of sight, depending on that disturbance of the adjusting power of the eye.

Many such cases come on under the same circumstances as rheumatism, viz., exposure to cold and damp, and admit of being perfectly cured by active general antiphlogistic and alterative treatment.

Sometimes the paralysis is of a more serious nature, being owing to some disease within the skull.

Cases of paralysis of the muscle which turns the eyeball outwards are of rarer occurrence than the preceding. There is no accompanying falling down of the upper eyelid; hence the double vision, arising from the non-correspondence of the two eyes when

the patient tries to look towards the side affected, is more felt.

This palsy is more tedious of cure than the preceding.

Another form of paralysis is that in which the eyelids cannot be shut. In such cases, all the corresponding side of the face is usually more or less paralysed.

These different classes of cases require early attention and careful treatment.

PART III.

CHAPTER I.

PREVENTION AND MANAGEMENT OF THE DISEASES OF
THE EYES APT TO OCCUR AT THE DIFFERENT
PERIODS OF LIFE.

*Early Infancy, or period at and from Birth, up to
Teething.*

Ophthalmia of New-born Infants.—Within a few days after birth, though sometimes later, infants are liable to an inflammation of the eyes, attended by great redness and swelling of the eyelids, with discharge of yellow matter.

This disease, if taken in time, and properly treated, may be in general completely cured. Left to itself, or inefficiently treated, however, it will run on so as to cause material injury, too often total destruction of the eyes. This is the cause of blindness in a large proportion of the blind poor.

The manner in which this disease is neglected, among the poorer classes especially, is almost incredible, notwithstanding the needful advice and medicines may be had for the asking. It is usually

only after the disease has been going on for two or three weeks, and when the eyes have already, perhaps, been irremediably injured, that the oculist is applied to. In excuse for this neglect, we are often told, by the mother or nurse, that the complaint of the eyes was supposed to be *nothing more than a cold*; as if a cold in the eyes might not, and did not, in many cases, prove very destructive to vision. The truth is, that, in numerous instances, a cold has some share at least in the production of this ophthalmia of new-born infants.

Exposure of the infant's eyes, immediately after birth, to light, the heat of the fire, or draughts of air; careless bathing of the eyes, perhaps with a dirty sponge; the direct intrusion into the eyes of the soap used in washing the infant, or of the spirits sometimes rubbed over its head, appear to be common exciting causes of the disease. That the disease is also frequently occasioned by inoculation of the eyes with morbid matter during labour, there can be no doubt.

The circumstance that a number of cases often come under the notice of the practitioner at the same time, and that a considerable interval will elapse before any new cases present themselves, would appear to show that the occurrence of the disease, like that of epidemics, is in some manner influenced by the weather.

To guard against the disease as far as possible, the eyes of infants, immediately after birth, should be gently bathed with simple warm water, by means of a bit of soft linen rag, and afterwards carefully dried. The greatest attention should always be paid to pro-

tect the eyes from exposure to light, heat, and draughts of air. At the same time, it must be remembered that the air ought not to be confined around the infant's face. Of course, good ventilation of the apartment is essential.

In many cases of the disease, we find that the infant is not suckled, but is nourished with prepared food. Under such a mode of diet, we find the inflammation apt to run a more dangerous course; and there can be little doubt that the want of the natural nourishment often promotes the invasion of the disease. For this reason, as well as for many others, infants should always, if possible, be brought up on breast-milk alone.

That an infant is actually affected with the inflammation of the eyes under consideration, may be known by the eyelids being red and swollen at their edges, by their being gummed together after sleep, and by the discharge of yellow matter which takes place from between them when they are opened. As soon as these symptoms are discovered, medical assistance should be called in. Every hour's delay is fraught with the most imminent danger to the sight.

It is to be kept in mind by those engaged about the infant, that the disease is catching—that matter from the infant's eyes accidentally coming into contact with the eyes, even of a grown-up person, is apt to excite in them an equally dangerous and destructive ophthalmia. It is also to be kept in mind, that, in ill-ventilated apartments, infection may be propagated through the air, especially from one infant to another.

Even when the eyes are not materially injured, or totally destroyed by the ophthalmia of new-born infants, they are apt to be left in a much debilitated state and very susceptible of future disease.

Not unfrequently, when the eyes are sufficiently far recovered to admit of accurate examination, we discover central cataract.

Cataract in Infants.—Whether the central cataract, which we sometimes discover after the subsidence of the ophthalmia of new-born infants, existed at birth, or came on during the inflammation, cannot always be with certainty determined, for want of previous accurate examination of the eyes at birth. There is, however, no doubt that the infant, at birth, is sometimes affected with cataract; and it is probable that in many of the cases of cataract first noticed in infancy and childhood, the opacity had already existed, though in a less degree, at birth.

Congenital cataract appears to be owing to an original imperfect formation of the crystalline lens; and, as in cases of congenital malformation of other parts of the eye and of other organs, several children of the same parents are sometimes found affected with it.

Though the occurrence of the disease in one child may make us dread lest the children of subsequent births be similarly afflicted, it is quite beyond our power to interpose any special means of prevention.

Of course, every attention should be paid to the mother's health during her pregnancy, and her mind should be, as much as possible, diverted from brooding

over the idea that the infant she is carrying may be also born blind from cataract.

The only remedy for congenital cataract, as for the cataract which occurs at other periods of life, is an operation.

If the cataract be limited to a small dot of opacity in the middle of the pupil, no operation is immediately called for. When, however, the opacity involves the whole lens, and evidently interferes materially with the sight, it is proper to operate.

The period after birth when the operation for the cure of congenital cataract should be had recourse to is before teething commences ; or, if that period has been allowed to pass, as soon after teething has been completed as possible.

The reason for the early performance of the operation is this:—As the infant cannot see, its eyes are not fixed on objects, but roll about in a heedless manner. This being allowed to go on, the infant loses command over the eyes, or rather does not acquire command over them ; and even if sight be afterwards restored by an operation, the power of directing the eyes properly and steadily towards objects may never be fully gained.

It is also to be observed that good sight is more likely to be restored by an early operation. Moreover, the important opportunity of education of and by the sight is secured.

The operation for congenital cataract is division. Infants above two years old may be put under the influence of chloroform ; but this is scarcely necessary in the case of younger infants.

They are sufficiently secured by wrapping them in a shawl, to confine their arms and hands, and laying them on their backs on a table.

The tender and delicate constitution of early infancy is no objection to the performance of the operation, because this is in itself extremely gentle. Not more than half a minute is taken up in its performance, and the pain is not greater than that of the prick of a needle. The infant will cry at the moment, but very soon after becomes pacified.

Usually no inflammation results, and in the course of some weeks the opaque lens is removed by absorption and sight proportionally restored.

Not unfrequently, however, some degree of opacity of the capsule supervenes, which may require a repetition of the operation for its removal from behind the pupil.

Congenital Imperfections of the Iris.—A congenital malformation of the eyes which sometimes occurs consists in an incomplete formation of the iris or its total absence.

The unfortunate subjects of this latter defect are painfully impressed by the too great influx of light into the eye, so that for relief they seek the dark, and keep their eyebrows depressed and their eyelids half closed. Their vision is also imperfect, partly from the dazzling which arises from the impression of too much light on the retina, and partly in consequence of such optical aberrations as it is the function of the iris with its pupil to correct. Comparatively small amelioration of the latter defect is derived from the use of an artificial iris, or dark plate with a small

aperture in it, placed before the eye when the child is old enough to wear it.

In cases of congenital absence of the iris, if cataract does not already coexist, it is very likely to come on sooner or later.

Congenital Amaurosis.—It sometimes happens that an infant, though old enough to notice, does not follow a lighted candle or other bright object with its eyes. This is sufficient to raise a suspicion of blindness from amaurosis or defective sensibility of the optic nerve.

This suspicion will probably prove too well founded if the eyeballs are at the same time smaller or larger than natural, or if they have a rolling motion in the sockets.

If, however, the eyes are otherwise healthy looking, and especially if the pupils contract naturally under the influence of the light, the child may, in the course of some months, come to give more and more evident signs of gaining strength of vision, which by the end of the first year may appear perfect.

When the eyes are much smaller than natural, there is no hope of sight being acquired.

A larger size of the eyes than natural sometimes occurs at birth, and is called dropsy of the eyes. The cornea in such cases, besides being unusually large, is opaque or cloudy. There appears to be at the same time defective sensibility of the retina. In a few instances the cornea has, with the growth of the child, become clear and some degree of vision been acquired.

Congenital Imperfections of the Eyelids.—Congenital imperfections of the eyelids occur, such as defective power of raising the upper eyelids, a state of matters

occasionally met with in several members of the same family.

Children are sometimes born with eyelids grown together at their edges.

Moles or mother's marks of different kinds occasionally occur on the white of the eye or on the eyelids, and require to be particularly attended to by the medical man.

Protection of the Eyes of Infants.—The eyes of infants should always be guarded from exposure to strong light. Especial care should be taken not to bring an infant suddenly from the dark into a bright light.

Nursemaids are often seen carrying their infantile charge with the eyes fully exposed to the sun's rays, and even stand a long time gossiping with other nursemaids, notwithstanding the child may be giving expression, by cries of distress, to the suffering it is undergoing from the exposure of its eyes to the light.

Toys should not be held close to the eyes of infants; nor should cap-strings, side knots of ribbons, and any bright object about the bed or cradle, or light calculated to attract the eyes, be allowed to remain, for fear of the infant acquiring a habit of squinting.

The eyes of infants while sleeping should be guarded from flies by gauze curtains to the cradle.

Infancy and Childhood, or period from the commencement of Teething up to about the eighth year.

Phlyctenular Ophthalmia.—From the commencement of teething till about eight years of age,

children are subject to an inflammation of the eyes usually attended by excessive intolerance of light, so that they cannot look up.

Out of one hundred cases of inflammation of the eyes in children at that time of life, it has been estimated that ninety are of this kind. Now, when we reflect how readily the disease leads to impaired sight, how obstinate it is, and how prone to relapse, the importance of palliative and preventive measures may be conceived, especially as much may be done to mitigate its attacks, if not ward them off altogether.

In children affected with this ophthalmia, there is usually a disordered state of the general health. The digestive organs and skin especially are found out of order. Besides the inflammation of the eyes, there may be eruptions about the head, sore ears, running from the nose, &c.

The disordered state of general health, of which the inflammation of the eyes under consideration is so often an accompaniment, is much dependent on an original delicacy of constitution of the child, but to a very great degree also on the diet, regimen, and weather.

Want of mother's milk during infancy, improper diet afterwards, impure air, insufficient clothing, are some of the predisposing causes of the complaint, whilst our variable climate powerfully aids their operation. We see the effect of the weather in the rapid changes this ophthalmia undergoes when it suddenly becomes either cold and wet, or dry and warm; all the symptoms being aggravated in the first case and ameliorated in the latter.

The first attack of the disease often comes on from the irritation of teething, after the measles, from cold, &c.

The preservation of the general health, as far as possible, by simple nourishing diet and comfortable clothing (flannel next the skin), tepid or cold bathing, friction of the skin, well-ventilated and moderately-lighted nursery (the best-ventilated room in the house should be selected for the nursery), and regular exercise in the open air, constitutes the most important preventive of this ophthalmia.

When the disease has once occurred, and there is a great tendency to relapse, removal from town to country, or to a more sheltered situation, or even to a milder climate will often be advantageous. A dry, warm, inland situation is, perhaps, preferable to the sea-side, the glare from the sea being apt to operate unfavorably.

An actual attack of the disease should be most carefully attended to, as neglect is very apt to lead to great injury of the eye and sight.

Every new attack renders the eyes useless for a long time at least, breaking up the health still further, and spoiling the temper of the child, to say nothing of interrupting the education.

Blair Eyes.—This is the result of an inflammation, chiefly affecting the edges of the eyelids, which has suffered frequent relapses, or never been properly treated.

The inflammation of the edges of the eyelids originates under somewhat similar circumstances as the preceding, and requires to be guarded against by similar means.

Care and management of the Eyes during Childhood.

—Children should not be permitted to sit up late, nor to fatigue the eyes by attempting to read, draw, sew, or the like, by candlelight.

They should be accustomed to rise early, but only after a good long night's rest.

Even when the eyes are impatient of light, the child ought not to be confined to a dark room, nor forbidden to go out in fine weather. When the child does go out, the eyes should be protected from the light by a bonnet-front shade.

It is at this period that attention is often for the first time, or at least more particularly, drawn to congenital defects of sight. Defective sight from congenital cataract in a less degree, for example, which may have hitherto remained undetected, is now often taken by the friends of the child for short-sightedness.

Youth and Adolescence.

Inflammation of the Cornea.—There are two forms of this inflammation; one characterised by great intolerance of light like phlyctenular ophthalmia,—the other not so much so, if at all.

The persons affected are usually of a constitution and state of health similar in many respects to what is above indicated in the cases of phlyctenular ophthalmia and blear eyes. The inflammation is equally, if not more stubborn and dangerous to the sight. The prevention and general management, therefore, are, in principle, the same.

Females are, perhaps, more frequently the subjects of this inflammation, and in them when, about the age of puberty, there is often disturbed menstruation. Under such circumstances, peculiar attention is requisite. Amongst other precautions, the patient should not be bound tightly up in stays.

Anterior Internal Ophthalmia.—Iritis, or inflammation of the iris, is sometimes met with at this period of life—perhaps as an extension of the inflammation of the cornea. Depending on the same state of constitution and health, and excited by the same causes, it is to be guarded against by similar means.

Posterior Internal Ophthalmia.—Dimness of sight, in a greater or less degree, is the symptom which generally first seriously attracts attention. Fixed muscæ, photopsy, headache, and intolerance of light, may or may not be precursors or accompaniments.

This form of posterior internal ophthalmia is met with principally in young adults of delicate constitution, more frequently females than males, and is commonly attributable to over-use of the eyes, with neglect of exercise, derangement of the stomach and bowels, disturbed menstruation, &c.

The prognosis is unfavorable; in the more advanced stage, very much so.

Care and management of the Sight in Youth and Adolescence.—It is at this period of life that the eyes come to be used in earnest, and defects of sight, which may have had their source in the earlier periods of life, now more particularly attract attention, or become more fully developed.

In many cases defective sight is, for the first time, occasioned by overwork of the eyes.

Excessive use of the eyes about this period is especially apt to render them asthenopic, that is, incapable of maintaining their adjustment for near objects, as in reading or sewing, for any length of time, p. 80.

Glasses for short-sightedness are now often for the first time required, p. 67.

Far-sightedness is sometimes met with in young persons after recovery from a fever, influenza, &c. Such cases should not be neglected, nor should those occurring under similar circumstances, in which the sight is dim for both near and distant objects, and in which, though the former are seen best, the sight is improved by convex glasses.

Adult Age.

Catarrhal, Rheumatic, and Catarrho-rheumatic Ophthalmia.—Persons of any age, of either sex, and otherwise healthy, may, by exposure to cold, be attacked by a catarrhal ophthalmia—a prominent symptom in which is as if there were some particles of dust in the eyes. An inflammation resembling rheumatism in its accompanying pain and its exacerbations, as also in the constitutional symptoms, inflammatory fever, derangement of digestive organs, and in its causes, predisposing as well as exciting, occurs only in adults, though more rarely than catarrhal ophthalmia, and than another inflammation partaking of the characters of both catarrhal and rheumatic.

Iritis, or inflammation of the Iris.—The causes of iritis are various; but their effect, if neglected or mis-

treated, is closure or obstruction of the pupil, whereby the light being stopped on its way to the retina, sight is prevented. In a large proportion of cases, if not in all, this fatal effect may be obviated by proper and timely treatment. But in numerous cases there is neither timely nor proper treatment. Notwithstanding the pain around the eye which so often attends the disease, the patient not only does not apply for assistance sufficiently early to prevent the obstruction of the pupil, but perhaps uses some irritating eye-water which only makes things worse. It is to be confessed, however, that in some cases of injured or destroyed sight from this cause, the medical man has been at fault. He has not recognised the true nature of the inflammation, but mistaking it for an external inflammation, such as catarrhal ophthalmia, he has merely ordered some stimulating eye-water, which has only aggravated the inflammation and hastened it on to its much-to-be-dreaded result of contracted or closed pupil.

The most common form of acute iritis is that connected with a rheumatic habit of the system.

The common exciting causes are: injuries; over-exertion of the sight, which may act as both predisposing and exciting cause; exposure of the eyes to too strong light and heat; exposure of the body to cold. Both eyes usually become affected.

Relapse is very frequent; but the earlier and more completely the first attack has been subdued, the less liability there is to relapses.

Prevention of relapse.—A person who has once suffered an attack of iritis should carefully guard

against sudden transitions from heat to cold, violent exertion, late hours, much reading and writing, and, at the same time, attend strictly to his diet. Sea-bathing is often useful in strengthening the system against the susceptibility. When a person has become liable to relapses, residence in a southern climate during two or three successive winters may be the means of saving him from his dreaded attack and breaking up the tendency.

Turn of Life.

Inflammation of the Eyes.—The eyes require still to be guarded against the inflammations above described as occurring in adult age.

Presbyopy and choice of spectacles.—The turn of life is the time when people most commonly find themselves compelled to have recourse to spectacles on account of presbyopy or long-sightedness. See “Far-sightedness,” p. 70.

Amaurosis.—About this time, also, those who have suffered at an earlier period from repeated attacks of ophthalmia, or who have for a long time over-exerted their eyes, are liable to a greater or less degree of impairment of the sight from diminution of the sensibility of the retina.

Altogether, the turn of life is a critical time for the sight as well as for the system generally. We ought, therefore, to endeavour to avoid, as much as possible, every unnecessarily prolonged exertion of the eyes in reading or other minute work, especially by artificial light.

Old Age.

Arthritic or gouty Ophthalmia.—Persons liable to become affected with this inflammation of the eyes have often been long subject to derangement of the digestive organs and internal congestions.

The eyes have seldom been previously altogether sound. The person has been subject to a sensation of fulness in the eyeballs, appearance of sparks of fire before the eyes, and even temporary attacks of blindness, in consequence of stooping, becoming heated, &c.

In persons in the condition of general health, and with the state of eyes just described, ophthalmic inflammation induced by any common occasional cause is prone to assume the form of arthritic posterior internal ophthalmia.

As more special causes, may be mentioned, suppressed gout, anxiety and mental distress, suppression of hemorrhoids, the suppression of any other habitual discharge, continued over-exertion of the eyes, strong light, cold, excessive use of tobacco, spirit drinking.

Presbyopia and change of Spectacles.—Long-sightedness which commenced about the turn of life is usually found to have increased in old age, requiring spectacles of a higher power. Sometimes not only a pair for reading with, but also a pair for viewing distant objects, is necessary.

Cataract.—Common hard lenticular cataract is now of frequent occurrence. See "Cataract of old persons," p. 39.

Glaucoma and Amaurosis.—At this period, sight is often irremediably lost from glaucoma or green

cataract and amaurosis, which perhaps has been coming on gradually for a long time.

Under such circumstances, a sudden attack of gouty inflammation of the eyes destroys the sight in a few days, or even a single night.

Persons at this period of life, who are at all pre-disposed to inflammation of the eyes, ought to be particularly careful in guarding against the causes of gouty ophthalmia above mentioned.

CHAPTER II.

PRESERVATION OF THE EYES IN CERTAIN GENERAL DISEASES, &c.

Preservation of the Eyes in Measles, Smallpox, Scarlet-fever, Hooping-cough.

THE eyes are liable to suffer from inflammation in these diseases, especially the two former.

Although, in general, the ophthalmia subsides with the general disease under very simple treatment, it should be as carefully watched as if it were an idiopathic or independent inflammation. By neglect, very serious or irretrievable injury to the eyes may accrue.

The particular forms of inflammation liable to arise in, or to which a tendency is apt to be left by, measles, scarlet-fever, and hooping-cough, are phlyctenular ophthalmia, the inflammation of the edges of the eye-lids, ending in blar eyes, inflammation of the lachrymal passages, with watery eye,—sometimes iritis.

In the course of the general disease, the eyes should be guarded from strong light, and bathed occasionally with tepid water.

During convalescence, especial care should be taken to guard against exposure to cold.

Variolous ophthalmia, or inflammation of the eyes in smallpox, is generally a much more severe and dangerous inflammation than that occurring in or supervening on the other diseases above mentioned, as used to be exemplified with such lamentable frequency before the general introduction of vaccination. Even yet we occasionally meet with cases of smallpox in which the eyes are destroyed. In smallpox, not only is a tendency left to phlyctenular ophthalmia, blear eyes, disease of the lacrymal passages, &c.; but the eyelashes are often partly lost, and partly turned in against the eyeball.

As a prophylactic measure during the eruptive stage, any matter which collects at the borders of the eyelids, is to be frequently washed away by means of tepid water; and, after each ablution, some mild salve is to be smeared along the borders of the eyelids.

The eyes are not safe even after the smallpox-pustules over the body have subsided, and the scabs fallen off. On the contrary, then is the chief danger to the eye, by abscess and destruction of the cornea. This generally occurs about the twelfth day of the eruption, but sometimes as late as five or six weeks after recovery from the primary disease.

In such a case, medical assistance is indispensably necessary.

Preservation of the Eyes after Fevers.

In great exhaustion, after typhus or yellow fever, abscess of the cornea occasionally occurs.

Amaurosis is not an uncommon effect of fever.

In a fever which has prevailed at different times in Dublin, and which prevailed very extensively in 1843 and 1844 in Edinburgh and Glasgow, an internal inflammation of the eye with amaurotic symptoms frequently supervened. It occurred chiefly in young adults, and its onset was generally traceable to some such exciting cause as exposure to cold, using the eyes too early after recovery from the fever, &c.

Over-work during convalescence from influenza is apt to bring on *muscæ volitantes* and even amaurosis.

Preservation of the Eyes in Child-bed and Suckling.

A most dangerous inflammation sometimes attacks the eyes in the fever of child-bed; but, considering the grave nature of the principal disease, the affection of the eye constitutes but a comparatively secondary consideration in the case.

Amaurosis is apt to come on after great losses of blood in child-bed.

The eyes and sight are very often much debilitated by prolonged suckling.

Preservation of the Eyes in Venereal Diseases.

Both gonorrhœa and syphilis are a source of dangerous and often destructive inflammation of the eyes.

A most dangerous inflammation of the eye,—one indeed which is often rapidly fatal to the sight,—is a purulent ophthalmia, occasioned by the accidental application of the matter of gonorrhœa to the eye.

The matter is sometimes accidentally applied to the eye of a healthy person through the medium of foul cloths, &c. It is in this way that children are sometimes inoculated. I have seen a little girl have her eye destroyed by the disease, having been inoculated by washing her face with a cloth which her worthless father had been using in wiping away his gonorrhœal discharge.

Inoculation with the matter of gonorrhœa* is not unfrequently the cause of the ophthalmia of new born infants, when the mother labours under that disease at the time of her confinement.

A person who has suffered from gonorrhœa often remains subject to severe attacks of rheumatism. The eyes, under such circumstances, sometimes suffer from inflammation of the iris, which presents the ordinary character above noticed under the head of iritis. This disease of the eyes is very liable to relapse, and by neglect or mismanagement often ends in much impaired or lost sight.

The inflammation of the eyes arising, as a secondary effect, from syphilis, is most generally an iritis of a very severe and dangerous character.

The constitutional disease appears to be in some cases the exciting as well as the predisposing cause; but in other cases, the iritis is excited by exposure to cold, over-use of the eyes, &c., which should therefore be avoided as much as possible by a person in a condition rendering him liable to be attacked.

* Inoculation with the matter of whites is a more frequent cause.

Prevention of the spread of contagious Ophthalmia in barracks, schools, workhouses, &c.

The matter from an eye affected with purulent ophthalmia, if applied to a healthy eye, will excite a similar inflammation. Such a communication by contact has often taken place from the use in common of towels, basins, &c., and so an ophthalmia has spread from one person to another. Without actual contact with matter, contamination of the air, by having matter dissolved in it, is a very common mode of propagation. Thus, when large bodies of people are crowded together, especially in dark, dirty, damp, ill-drained, and ill-ventilated dwellings, contagious ophthalmia is apt to break out. This is the explanation of its propagation in armies, schools, workhouses, prisons, &c. The original cause of this disease was at one time supposed to be a peculiar contagion, first imported into Europe from Egypt (hence the epithet Egyptian), by the English and French armies. It is now, however, pretty generally conceded, that the disease does not depend on any such peculiar contagion, but that it may arise from occasional atmospherical influences, sometimes in isolated cases, sometimes epidemically. There are also local influences which render the disease endemic in many other places besides Egypt.

The disease, in a more or less latent state, is very common among the lower classes of Irish.

When the disease is prevalent among a number of people necessarily collected together, the healthy

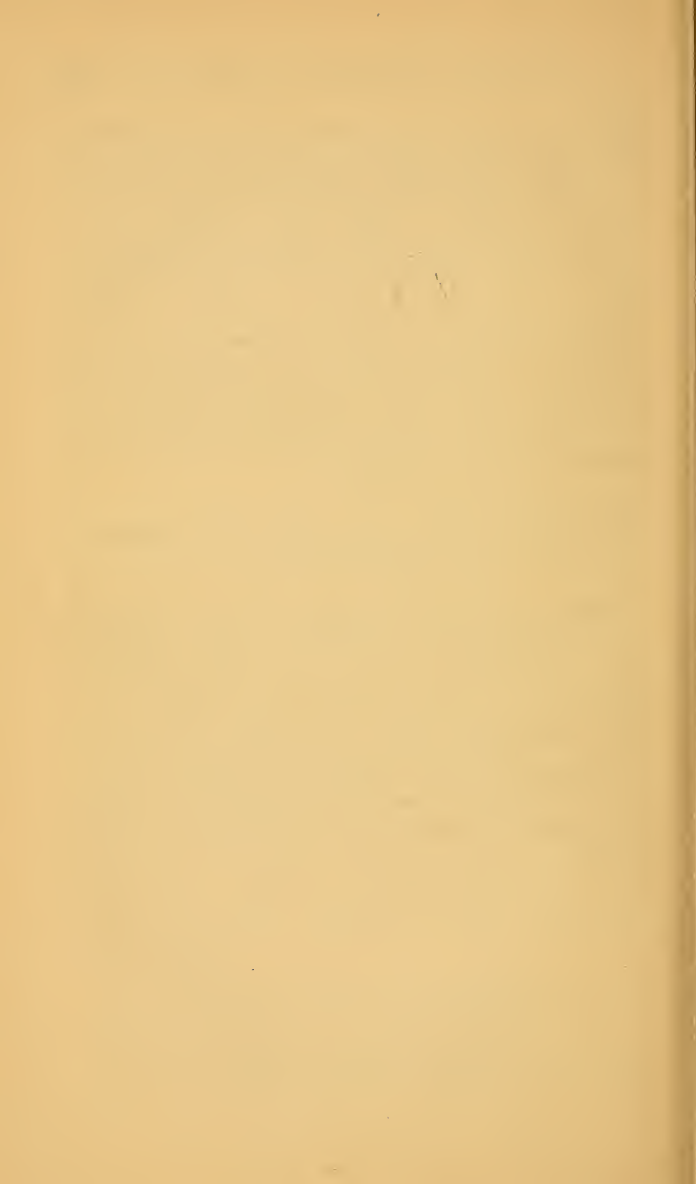
should be immediately separated from the diseased, and the eyes of the healthy should be inspected daily.

Amongst soldiers, the predisposition is occasioned by their exposure on guard, their crowding in barracks not over-clean or well-ventilated, drinking, improper clothing—especially tight collars and heavy caps.

About twenty years ago the disease was very prevalent in the Belgian army. By the discharge of the diseased soldiers, and their return to private life, the ophthalmia has been propagated among the lower classes of civilians in Belgium.

Prejudicial influence on the Sight of the excessive use of Tobacco.

With a disposition to congestion of the eyes, the use of tobacco operates most injuriously on the sight. Persons affected at an earlier age than usual with glaucomatous amaurosis, or that state of the eyes in which inflammation from any occasional cause is apt to assume the gouty character and rapidly destroy sight, I have often found to have been long addicted to an excessive use of tobacco and sometimes spirit-drinking.



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By the Same Author.

I.

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